Edwards

INSTRUCTIONS
03-A344-02-882
MARCH 1985
(Supercedes
03-A344-02-881)

ROTARY VACUUM PUMPS

E1M40-E2M40/E1M80-E2M80

and

E2M40S/E2M80S

(SUPERPUMPS)

OPERATING AND SERVICE MANUAL

SUPPLIED BY

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ADDENDUM
03-A344-02-882
MARCH 1987

E1M80, E2M80, E2M80 SUPERPUMP

The cooling fan code number A22301002 has now been replaced with a new fan code number A22301003. In addition the two side baffles A25970046 have now been deleted from the pumps.

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ATTENTION

All reference and information contained within these instructions up to **PAGE 30** inclusive apply only to **E1M40/E2M40 - E1M80/E2M80** and **HERMETICALLY** sealed rotary vacuum pumps. Further references, information, parts lists, data and illustrations contained in **PAGES 31 to 43** inclusive apply to **E2M40S - E2M80S SUPERPUMPS**

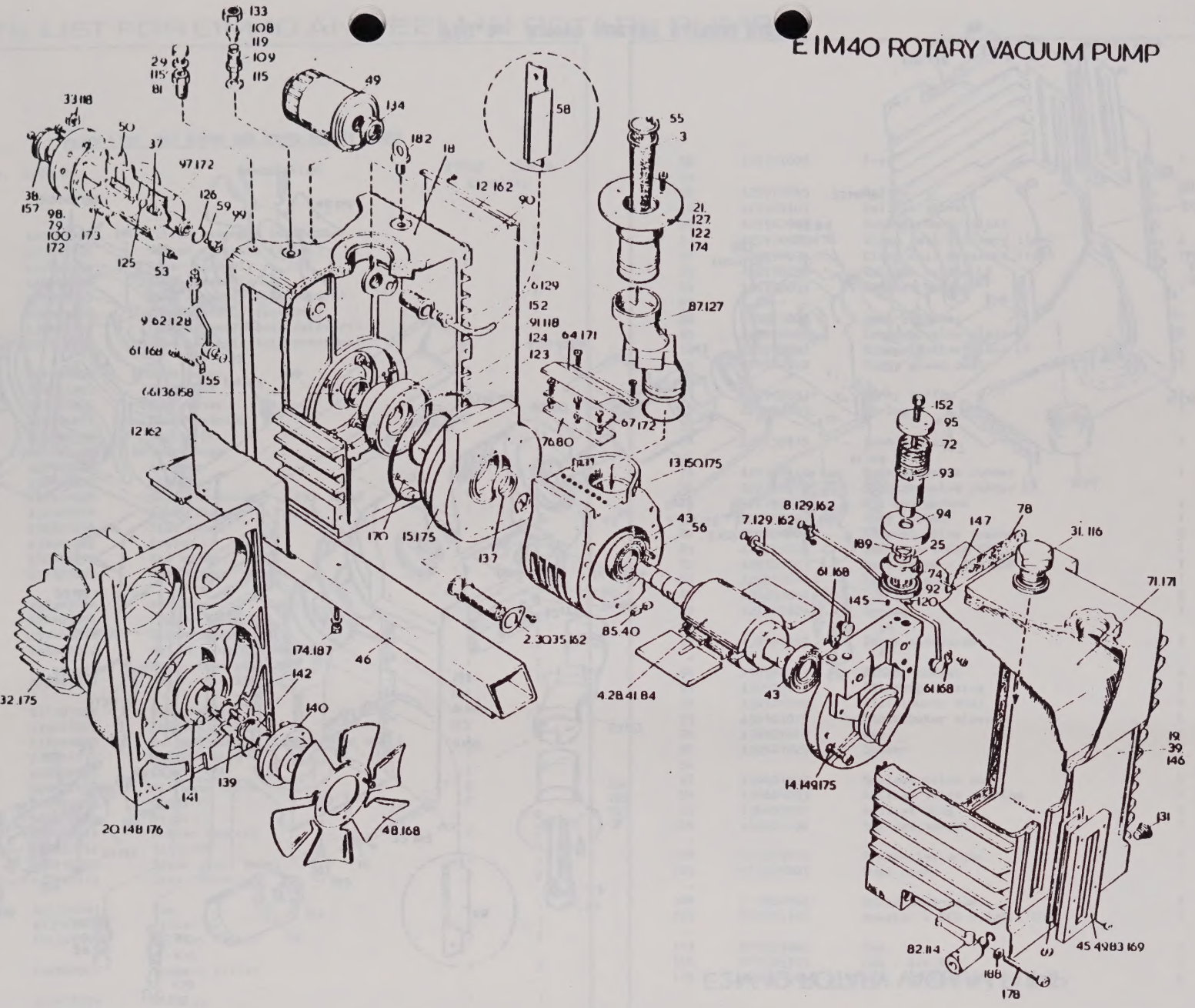

FIG. 1 E1M40 ROTARY VACUUM PUMP

E2M40 ROTARY VACUUM PUMP

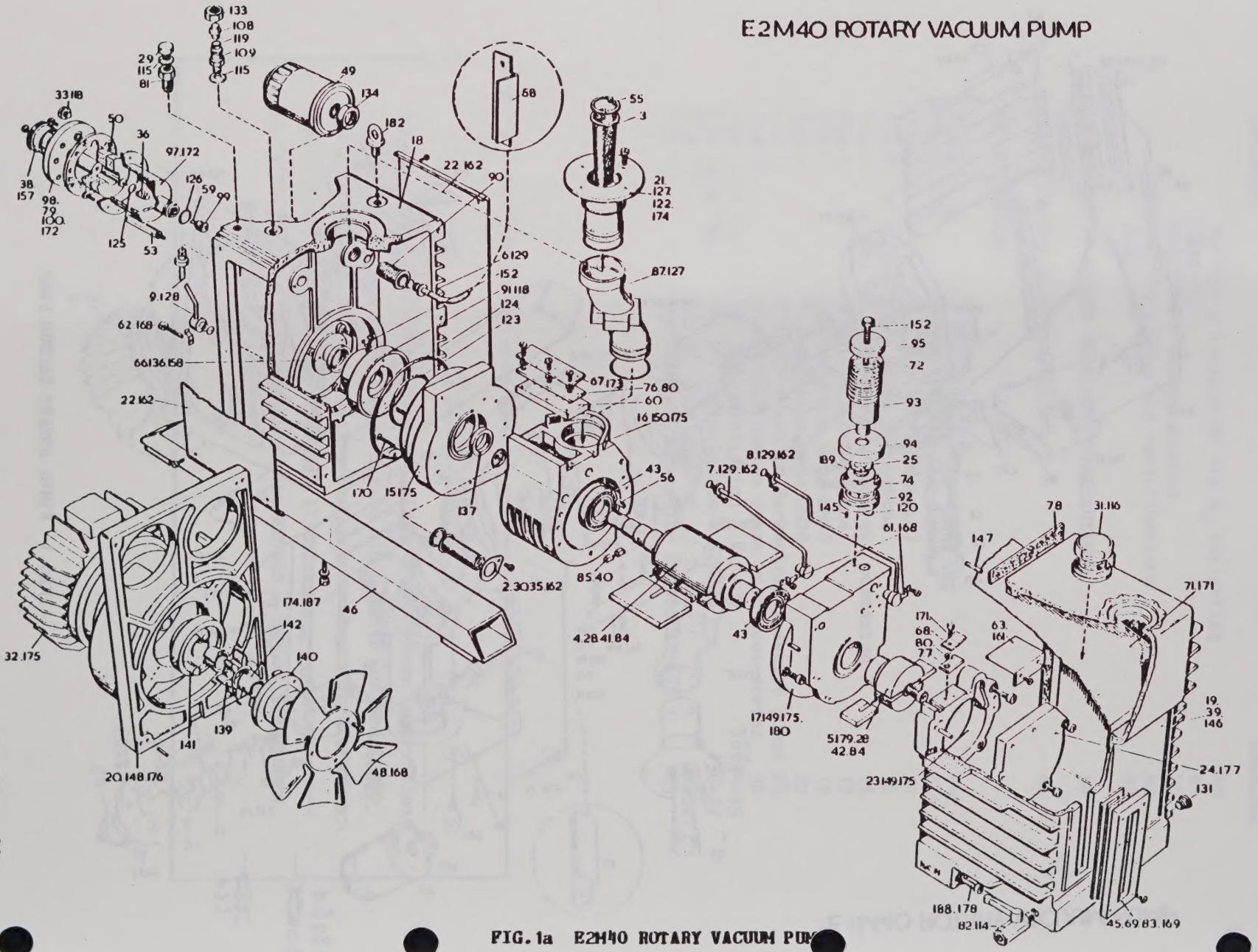

FIG. 1a E2M40 ROTARY VACUUM PUMP

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PARTS LIST FOR E1M40 AND E2M40 ROTARY PUMPS

Item No.	Code No.	Description	E1M40 Quantity	E2M40 Quantity
1				
2	A22305008	Filter assembly (oil)	1	1
3	A22305035	Filter assembly (inlet)	1	1
4	A26401039	Rotor assembly	1	1
5	A26401040	Rotor assembly LV		1
6	A27879001	Tube assembly (oil return)	1	1
7	A34401007	Tube assembly (ballast)	1	1
8	A34401006	Tube assembly (oil delivery)	1	1
9	A27879009	Tube assembly (oil pressure)	1	1
-				
12	A34401004	Side panel	2	
13	A34401002	Stator HV	1	
14	A34401005	Rear cover	1	
15	A36401001	Front bearing	1	1
16	A36401002	Stator HV		1
17	A36401030	Interstage		1
18	A36401006	Adaptor	1	1
19	A36401027	Oil box	1	1
20	A36401008	Motor mounting	1	1
21	A36401024	Inlet flange	1	1
22	A36401014	Side panel		2
23	A36401012	Stator LV		1
24	A36401013	End cover		1
25	A34301037	Distributor weight	1	1
-				
28	A00307046	Spring	3	4
29	A01403074	Plug - 1/8in BSP	1	1
30	A01403030	Filter seal	1	1
31	A26002022	Filler plug 1in BSP	1	1
32		Motor (see label)	1	1
33	A26002018	Plug - ¼in BSP	1	1
34				
35	A11101054	Clamp plate	1	1
36	A19201007	Ballast piston		1
37	A19201008	Ballast piston (less rubber seal)	1	
38	A19201013	Ballast knob	1	1
39	A20001063	Label	1	1
40	A20402116	Oil pump blade	2	2
41	A20402099	Blade HV	2	
42	A20402101	Blade LV		2
43	A20404011	Roller bearing	2	2
44	A20402152	Blade HV		2
45	A20416002	Sight glass bezel	1	1
46	A20499019	Base rubber	2	2
47				
48	A22301003	Fan	1	1
49	A22304087	Filter	1	1
50	A22305041	Ballast filter	2	2
-				
53	A22404006	Support pillar	2	2
54				
55	A22426004	Circlip	1	1
56	A24301008	Key	1	1
57				
58	A25970045	Baffle	2	2
59	A25904601	Ballast valve	1	1
60	A25942008	Exhaust cover plate		1
61	A25970035	Clamp (oil delivery line)	2	2
62	A25970036	Clamp (oil pressure line)	1	1
63	A25970038	Exhaust baffle LV		1
64	A25970039	Exhaust baffle	1	
65				
66	A25971002	Seal retainer	1	1
67	A25976006	Exhaust valve plate	1	1
68	A25976007	Exhaust valve plate LV		1
69	A26501012	Sight glass seal	1	1
70				
71	A25976033	Spray baffle	1	1
72	A27102013	Spring	1	1
73				
74	A27159415	Rubber seal	1	1
75				
76	A27159514	Exhaust valve rubber	1	1
77	A27159515	Exhaust valve rubber LV		1
78	A27159629	Oil box gasket	1	1
79	A27159428	Body gasket	1	1
80	A27804004	Exhaust valve spacer	3	3
81	A27911003	Socket - 1/8in BSP	1	1
82	A28702003	Ball valve - ¼in BSP	1	1
83	A29201006	Sight glass	1	1
84	A29203002	Pin	3	4
85	A27192924	Spring	1	1
86				
87	A36501009	Inlet connexion	1	1
-				
90	A36501013	Filter outlet	1	1
91	A36501014	Oil pump housing	1	1
92	A36501015	Distributor body	1	1
93	A36401019	Distributor sleeve	1	1
94	A36401028	Cap	1	1
95	A36401029	Spacer	1	1
96				
97	A36601032	Ballast valve body	1	1
98	A36601033	Ballast valve bearing	1	1
99	A36601034	Ballast plug	1	1
100	A36601036	Ballast spindle	1	1
-				
104	B21023019	Protective cover	1	1
105	B21024001	Dust cover	1	1
-				
108	C11001062	Blind tailpiece	1	1
109	C11001180	Adaptor - SC5 x 1/8in BSP	1	1
-				
113	H01503006	Cap	1	1
114	H01503333	Cap - ¼in BSP	1	1
115	H02104001	Seal - 1/8in BSP	2	2

PARTS LIST FOR E1M40 AND E2M40 ROTARY PUMPS

Item No.	Code No.	Description	E1M40 Quantity	E2M40 Quantity
116	H02104008	Seal - 1in BSP	1	1
117				
118	H02104002	Seal - ¼in BSP	1	1
119	H02120027	O-ring	1	1
120	H02120031	O-ring	1	1
121				
122	H02120057	O-ring	1	1
123	H02120082	O-ring	1	1
124	H02120097	O-ring	1	1
125	H02125011	O-ring	1	1
126	H02125020	O-ring	1	1
127	H02125044	O-ring	2	2
128	H02125115	O-ring	2	2
129	H02125116	O-ring	5	5
130				
131	H03517002	Plug - ¼in	2	2
132				
133	H03400008	Union nut - 3/8in BSP	1	1
134	216814314	Locknut - ¼in x 16 UNF	1	1
135				
136	H02109094	Seal	1	1
137	H02109064	Oil seal	1	1
138				
139	A21071033	Flexible component	1	1
140	A21071037	Coupling flange	1	1
141	A21071038	Coupling flange	1	1
142	A21071039	Taper lock bush	2	2
-				
145	211174099	Spring pin	1	1
146	211430301	Rivet	4	4
147	212170186	Spring pin	2	2
148	212181041	Dowel	2	2
149	212192021	Taper pin	2	4
150	212192026	Taper pin	2	2
151				
152	218002339	Screw M5	1	1
-				
157	218032290	Screw M4	1	1
158	218032328	Screw M5	3	3
-				
161	218042287	Screw M4		2
162	218042328	Screw M5	16	16
-				
165	218072409	Screw M8	2	2
-				
168	218091328	Screw M5	5	5
169	218091330	Screw M5	8	8
170	218091332	Screw M5	4	4
171	218091369	Screw M6	5	8
172	218091370	Screw M6	11	4
173	218091371	Screw M6		3
174	218091411	Screw M8	8	8
175	218091412	Screw M8	19	21
176	218091415	Screw M8	4	4
177	218091417	Screw M8		4
178	218091421	Screw M8	6	6
179	218091453	Screw M10		1
180	218121449	Screw		1
181				
182	218790005	Eyebolt M12	2	2
-				
187	218980210	Washer	4	4
188	218985810	Washer M8	6	6
189	218990201	Washer	1	1
190				
191	A20001084	Label	1	1
192	E20001063	Label	1	1
193	A20001085	Label	1	1
-				
*198	H11002013	No.15 oil - 5 litres	1	1
*199	C10520004	NW25/tube pack (exhaust)	1	1
*200	A36401025	Inlet pack	1	1
**205	H02109065	Spiroseal	1	1
**206	H02109075	Seal	1	1

*NOT SHOWN

**HYDROCARBON PUMPS ONLY IN PLACE OF ITEM 136

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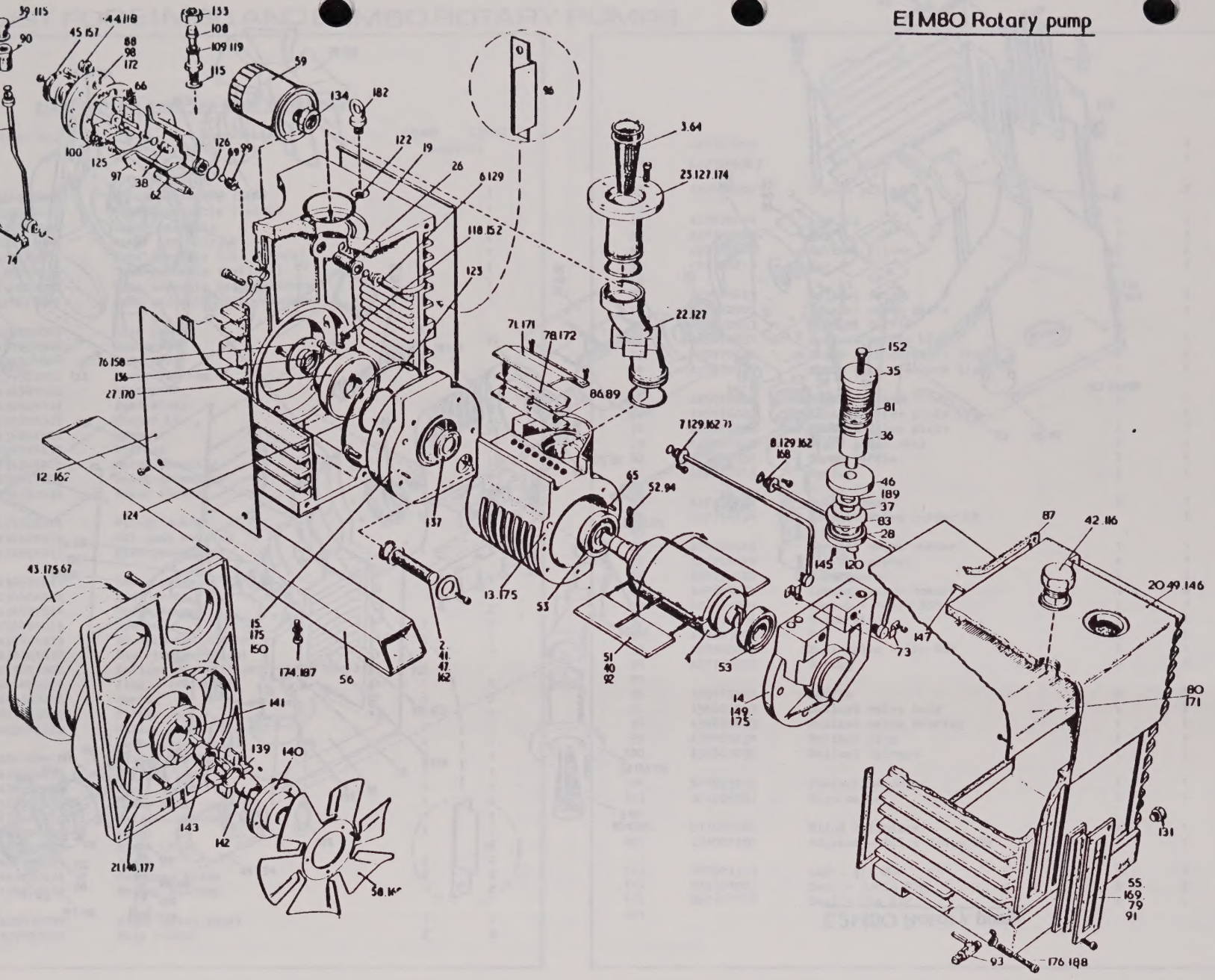

FIG.2 E1M80 ROTARY VACUUM PUMP

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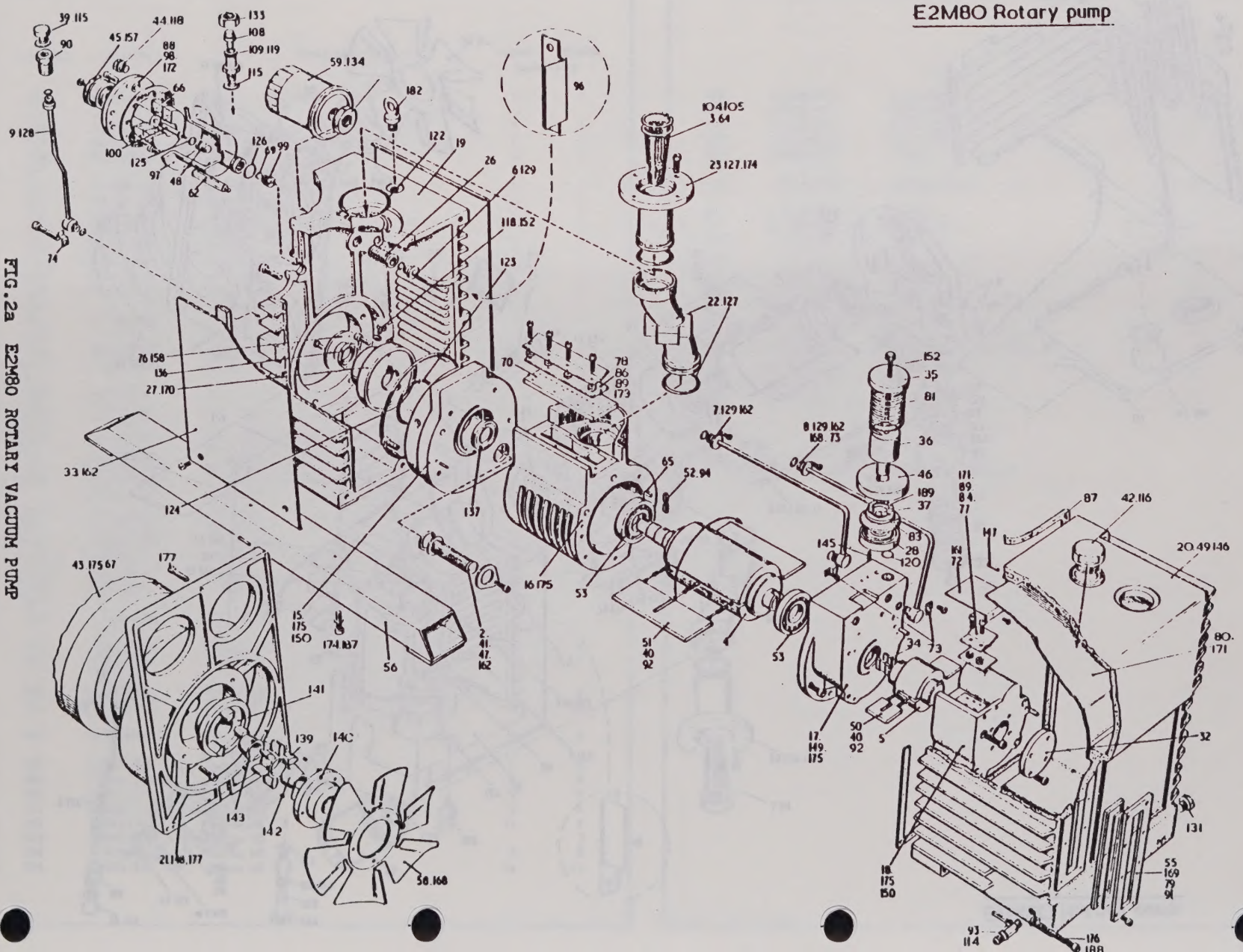

FIG.2a E2M80 ROTARY VACUUM PUMP

PARTS LIST FOR E1M80 AND E2M80 ROTARY PUMPS

Item No.	Code No.	Description	E1M80 Quantity	E2M80 Quantity
1				
2	A22305008	Filter assembly (oil)	1	1
3	A22305035	Filter assembly (inlet)	1	1
4	A26401038	Rotor assembly	1	1
5	A26401042	Rotor assembly LV		1
6	A27879001	Tube assembly (oil return)	1	1
7	A36501038	Tube assembly (ballast)	1	1
8	A36501036	Tube assembly (oil delivery)	1	1
9	A27879007	Tube assembly (oil pressure)	1	1
-				
12	A34501005	Side panel	2	
13	A34501002	Stator HV	1	
14	A34501008	Rear cover	1	
15	A36501001	Front bearing	1	1
16	A36501002	Stator HV		1
17	A36501035	Interstage		1
18	A36501005	Stator LV		1
19	A36501026	Adaptor	1	1
20	A36501034	Oil box	1	1
21	A36501027	Motor mounting	1	1
22	A36501009	Inlet connexion	1	1
23	A36501032	Inlet flange	1	1
-				
26	A36501013	Filter outlet	1	1
27	A36501014	Oil pump housing	1	1
28	A36501015	Distributor body	1	1
-				
32	A36501021	Cover plate		1
33	A36501028	Side panel		2
34	A36501024	Drive member		2
35	A36401029	Spacer	1	1
36	A36401019	Distributor sleeve	1	1
37	A34301037	Distributor weight	1	1
38	A19201008	Ballast piston (less rubber seal)	1	
39	A01403074	Plug - 1/8in BSP	1	1
40	A00307046	Spring	3	5
41	A01403030	Filter seal	1	1
42	A26002022	Filler plug - 1in BSP	1	1
43		Motor (see label)	1	1
44	A26002018	Plug - ¼in BSP	1	1
45	A19201013	Ballast knob	1	1
46	A36401028	Cap	1	1
47	A11101054	Clamp ring	1	1
48	A19201007	Ballast piston		1
49	A20001063	Label	1	1
50	A20402087	Blade LV		2
51	A20402089	Blade HV	2	2
52	A20402116	Oil pump blade	2	2
53	A20404012	Roller bearing	2	2
54				
55	A20416002	Sight glass bezel	1	1
56	A20499015	Base runner	2	2
57				
58	A22301002	Fan	1	1
59	A22304087	Filter	1	1
-				
62	A22404006	Suport pillar	2	2
63				
64	A22426004	Circlip	1	1
65	A24301008	Key	1	1
66	A22305041	Ballast filter	2	2
67	A24301013	Key	1	1
68				
69	A25904601	Ballast valve	1	1
70	A25942005	Exhaust cover plate		1
71	A25970033	Exhaust baffle	1	
72	A25970034	Exhaust baffle LV		1
73	A25970035	Clamp (oil delivery line)	2	2
74	A25970036	Clamp (oil pressure line)	1	1
75				
76	A25971002	Seal retainer	1	1
77	A25976002	Exhaust valve plate LV		1
78	A25976005	Exhaust valve plate	1	1
79	A26501012	Sight glass seal	1	1
80	A25976034	Spray baffle	1	1
81	A27102013	Spring	1	1
82				
83	A27159415	Rubber seal	1	1
84	A27159504	Exhaust valve rubber LV		1
85				
86	A27159509	Exhaust valve rubber	1	1
87	A27159618	Oil box gasket	1	1
88	A27159428	Body gasket	1	1
89	A27804004	Exhaust valve spacer	3	6
90	A27911003	Socket - 1/8in BSP	1	1
91	A29201006	Sight glass	1	1
92	A29203002	Pin	3	5
93	A28702003	Ball valve - ¼in BSP	1	1
94	A27102024	Spring	1	1
95				
96	A25970046	Baffle	2	2
97	A36601032	Ballast valve body	1	1
98	A36601033	Ballast valve bearing	1	1
99	A36601034	Ballast plug	1	1
100	A36601036	Ballast spingle	1	1
-				
104	B21023019	Protective cover	1	1
105	B21024001	Dust cover	1	1
-				
108	C11001062	Blind tailpiece	1	1
109	C11001180	Adaptor - SC5 x 1/8in BSP	1	1
-				
114	H01503333	Cap - ¼in BSP	1	1
115	H02104001	Seal - 1/8in BSP	2	2
116	H02104008	Seal - 1in BSP	1	1
117				

PARTS LIST FOR E1M80 AND E2M80 ROTARY PUMPS

Item No.	Code No.	Description	E1M80 Quantity	E2M80 Quantity
118	H02104002	Seal - 1in BSP	1	1
119	H02120027	O-ring	1	1
120	H02120031	O-ring	1	1
121				
122	H02120057	O-ring	1	1
123	H02120082	O-ring	1	1
124	H02120101	O-ring	1	1
125	H02125011	O-ring	1	1
126	H02125020	O-ring	1	1
127	H02125044	O-ring	2	2
128	H02125115	O-ring	2	2
129	H02125116	O-ring	5	5
130				
131	H03517003	Plug - ¼in BSP	2	2
132				
133	H03400008	Union nut - 3/8in BSP	1	1
134	216814314	Locknut - ⅜in x 16 UNF	1	1
135				
136	H02109094	Seal	1	1
137	H02109064	Oil seal	1	1
138				
139	A21071033	Flexible component	1	1
140	A21071037	Coupling flange	1	1
141	A21071038	Coupling flange	1	1
142	A21071039	Taper lock bush	1	1
143	A21071040	Taper lock bush	1	1
144				
145	211174099	Spring pin	1	1
146	211430301	Rivet	4	4
147	212170186	Spring pin	2	2
148	212181041	Dowel	2	2
149	212192021	Taper pin	2	2
150	212192026	Taper pin	2	4
151				
152	218002339	Screw M5	1	1
-				
157	218032290	Screw M4	1	1
158	218032328	Screw M5	3	3
-				
161	218042287	Screw M4		2
162	218042328	Screw M5	15	15
-				
165	218072409	Screw M8	2	2
-				
168	218091328	Screw M5	5	5
169	218091330	Screw M5	8	8
170	218091332	Screw M5	4	4
171	218091369	Screw M6	2	6
172	218091370	Screw M6	8	4
173	218091371	Screw M6		8
174	218091411	Screw M8	8	8
175	218091412	Screw M8	19	23
176	218091421	Screw M8	6	6
177	218091415	Screw M8	7	7
178	218121449	Screw M10		1
-				
182	218790005	Eyebolt M12	2	2
-				
187	218980210	Washer M8	4	4
188	218982710	Washer M8	6	6
189	218990201	Washer	1	1
190				
191	A20001084	Label	1	1
192	E20001063	Label	1	1
193	A20001085	Label	1	1
-				
*197	H11002014	No.15 oil - 2½ litres	1	1
*198	H11002013	No.15 oil - 5 litres	1	1
*199	C10520004	NW25/tube pack (exhaust)	1	1
*200	A36401025	Inlet pack	1	1
**215	H02109065	Spiroseal	1	1
**216	H02109075	Seal	1	1

*NOT SHOWN
**HYDROCARBON PUMPS ONLY IN PLACE OF ITEM 136

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Data and Specification

Pump model		E1M40	E2M40	E1M80	E2M80
Displacement (swept volume)	($m^3 h^{-1}$)				
	50Hz motor	42.5	42.5	80	80
	60Hz motor	50.5	50.5	64	64
Speed (PNEUROP)	($m^3 h^{-1}$)				
	50Hz motor	37	37	74	74
	60Hz motor	44	44	61	61
Ultimate vacuum:					
without gas ballast (Partial press.)	(mbar)	3×10^{-2}	2×10^{-4}	5×10^{-2}	2×10^{-4}
with gas ballast (Partial press.)	(mbar)	4×10^{-1}	5×10^{-3}	4×10^{-1}	5×10^{-3}
Maximum inlet pressure for water vapour	(mbar)	40	7	30	5
Gas ballast flow (maximum)	($m^3 h^{-1}$)	3.5	1.7	3 to 3.5	1.3 to 1.4
Pump rotational speed (rev/min)					
	50Hz motor	1410	1410	1420	1420
	60Hz motor	1720	1720	1140	1140
Normal operating temperature: (@ 20°C Ambient)					
without gas ballast	°C	40	40	44	36
with gas ballast		-	-	-	-
Oil capacity	(litres)	4.5	4.5	7	7
Recommended grade of oil		EDWARDS NO. 15 or NO. 17			
Motor rating (50Hz)	(kW)	1.1 (4 pole)	1.1 (4 pole)	2.2 (4 pole)	2.2 (4 pole)
(60Hz)		1.5 (4 pole)	1.5 (4 pole)	1.8 (6 pole)	1.8 (6 pole)
Weight of pump	(kg)	70.5	72	95	105
Inlet connexion		ISO KF40 flange reversible to provide ISO SC40 screwed connexion			
Outlet flange		25mm flange - suitable for ISO KF25 or ISO SC25 screwed connexion			
Product description:		Ordering No:			
Pump 220/240V or 380/415V ± 6%, 3 phase, 50Hz		03-A344-01-935	03-A364-01-935	03-A345-01-935	03-A365-01-935
Pump 230V or 460V, 3 phase, 60Hz		03-A344-01-982	03-A364-01-982	03-A345-01-982	03-A354-02-982

GENERAL DESCRIPTION

The E1M40, E2M40, E1M80 and E2M80 series high vacuum pumps are single and two-stage models of 40 and 80 $m^3 h^{-1}$ nominal displacement respectively. They are of direct drive, sliding vane type, designed for reliable long term operation in both laboratory and industrial environments. The pumps are air-cooled and incorporate gas ballast facilities. They are generally similar in construction, the two-stage units employing a 5:1 stage ratio with interstage discharge valve. Air and oil suck-back is automatically prevented on shut-down*.

*NOTE: On single stage pumps a permanent air suck back is not ensured unless a magnetic valve is introduced into the gas ballast port.

Direct drive is provided via a flexible coupling from a 4-pole, 3-phase motor (Note: 60Hz versions of 80 $m^3 h^{-1}$ pumps employ 6-pole motors with corresponding reduction in pumping speed). A full range of accessories is available for the pumps as described on page 16.

Construction

The pumps are of slotted rotor/sliding vane type and the two-stage versions incorporate separate high vacuum (HV) and low vacuum (LV) stages with inter-connecting ports. Each stage comprises a separate rotor and stator assembly. The drive from the HV rotor to the LV rotor of the E2M80 is via steel drive plates stressed to prevent backlash; the HV rotor is supported in roller bearings housed in the front and interstage housings and the LV rotor in journal bearings. The E2M40 employs a unique arrangement for clamping the HV and LV rotors together with perfect concentricity so that they operate as a single structure; roller bearings are used at both ends of the HV rotor and a journal bearing at the remote end of the LV rotor.

Positive lubrication is provided by a sliding vane type oil pump, the rotor of which is integral with the high vacuum rotor and situated at the driven end of the latter. The oil pump is isolated from the vacuum pump by a viton lip seal. the oil is drawn into the pump through a wire mesh strainer and is pumped along oil-ways to a spring loaded distributor valve which directs a lightly pressurised supply to the main vacuum pump and by-passes the excess - some through a large area fine pore filter* and some through a relief valve - back to the oil reservoir. Should the filter become blocked, all the oil returns through the relief valve. The fine-pore filter can be replaced by an adaptor carrying feed and return pipes for a large external filter should the pumping duty require it. (for details see ACCESSORIES, page 16).

*Omitted on Fomblin pumps.

An oil duct from the oil pump leads to an external connexion to permit oil pressure operation of an external safety device such as a pressure switch to indicate pump stoppage for any reason.

The spring loaded distributor valve provides oil and air suck-back protection*. Oil sealing of the drive shaft is effected by lip-type viton seals positioned in the oil pump housing and in the front bearing housing. The level of oil in the oil box reservoir is indicated by a slight-glass mounted in the end wall of the oil box. An oil filler plug is provided in the top of the oil box and an oil drain cock is fitted in the base.

*NOTE: On single stage pumps a permanent air suck back is not ensured unless a magnetic valve is introduced into the gas ballast port.

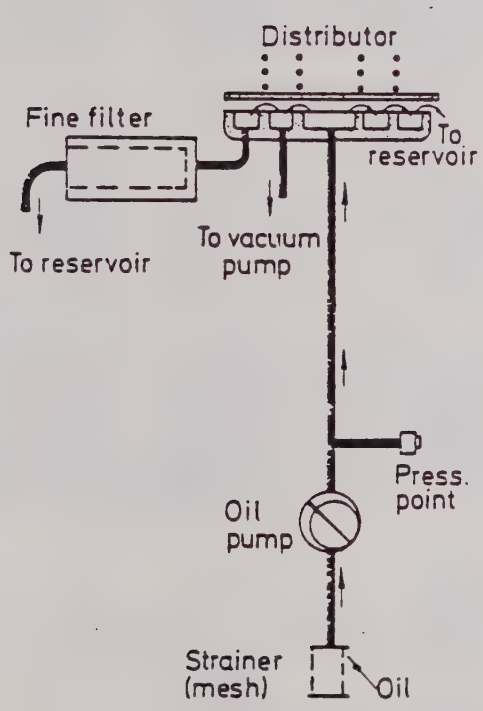


Fig. 3. Oil system (schematic)

The gas ballast facility consists of an externally mounted control valve communicating with the pump interior to permit manual control of air/gas ballasting. The pump inlet port provides the options of ISO40 flange connexion or KF40 coupling systems; the pump discharge port is compatible with KF25 and with 'muff' coupling to 28mm (external Ø)tube. A length of tube is provided together with appropriate size muff coupling fittings. This facilitates connexion by rubber or plastic hose. The pump is mounted on steel runners and is free-standing; suitable anti-vibration mounts are also available.

Working principle:

During operation, the rotor blades sweep the crescent shaped volume formed by the eccentrically mounted rotor and the stator; as each blade passes the inlet, a quantity of gas is induced and subsequently trapped and compressed by the following blade until finally ejected via the discharge valve.

Gas ballasting

The E1M40, E2M40 and E1M80, E2M80 series pumps incorporate a gas ballast facility to enable them to pump most condensable vapours directly without significant contamination of the pump oil. This entails the introduction of a quantity of gas or air at atmospheric pressure, via a manually operated valve, into the compression space under the discharge valve whilst the gas/vapour mixture in this volume is at a comparatively low pressure. When the volume of gas/vapour mixture is compressed prior to expulsion, the discharge valve opens before the partial pressure of the vapour component is high enough to cause it to condense.

INSTALLATION

Unpacking

Remove all packing material, protective blanks and covers and inspect the pump outfit for possible damage during transit.

Mounting

The pump outfit is free-standing on steel runners. Four 12 mm Øholes are provided on the runners but free-standing is normally satisfactory; in this case the use of machine mounting pads positioned under the runners is recommended. Pedestal anti-vibration mountings are available for frame mounting or other special requirements - refer to ACCESSORIES, page 16 for details.

Vacuum inlet connexion (Figs. 4 and 4A)

The vacuum inlet flange has four M8 (threaded) holes equispaced on 80 mm pitch circle Ø and is suitable for connexion to:

(i) ISO40 size vacuum flanges
(ii) KF40 clamped coupling system

*Note: For connexion to the KF coupling systems - a 40mm Cc-seal is supplied together with 'C' clamp, washer (M8) and a screw (M8). These items are supplied separately in pack Code No. 08-C110-05-115. For assembly details, see Fig. 4 and Fig. 4A.

For optimum pumping speed, connecting pipelines should be of minimum length and bore size not less than the inlet port dimensions. A flexible connection should be positioned in the pipeline from the pump to the system; this is most essential if anti-vibration mountings are utilised.

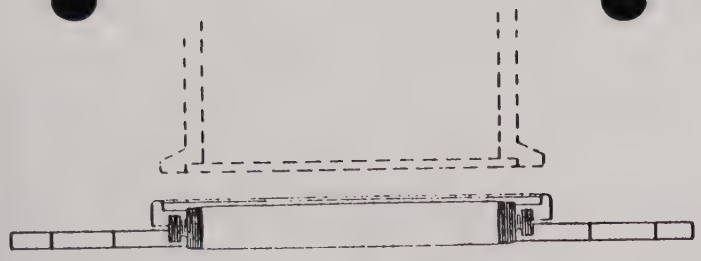


Fig4 KF40 flanged body to ISO40 flange

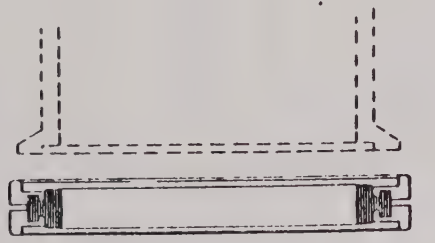


Fig4a KF40 body to KF40 body

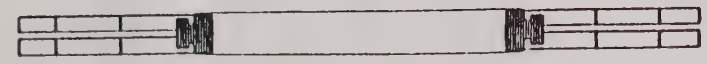


Fig4b ISO40 flange to ISO40 flange

The pack contains the following items:

Item	Description	Code No.	Quantity
1	'C' Clamp	C110-05-040	1
2	Co-Seal, 40mm	B271-58-160	1
3	Screw, M8 x 25mm	21807-2412	2
4	Washer, M8, shakeproof	21898-4010	2

Code No. 04-A364-01-025

L1/81

To connect the pump inlet:
(Figs. 4, 4A, 4B)

(a) to KF40 flanged component:

Position the one plastic carrier (Co-seal component) on pump inlet flange with the concentric groove facing upwards. Place the rubber seal inside the carrier then fit a metal carrier on top with the concentric groove facing downwards. The connexion with the KF flange will then fit within the lip of the metal carrier and will be held down by the 'C' clamp, screws and washers.

Note: To connect KF40 flanged components together - use the two metal carriers with the seal positioned between the carriers in the concentric grooves.

(b) to 40mm flange:

The two plastic carriers will be required -press carriers together with rubber seal inserted in the annular grooves in the carriers and bolt flanges together.

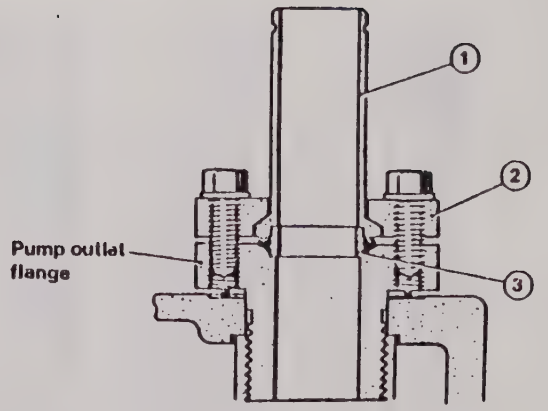


Fig.5 Outlet Connexion

The pack contains the following items:

Item	Description	Code No.	Quantity
1	Adaptor	C105-04-007	1
2	'C' Clamp	C110-04-040	1
3	Centring ring, KF25	C105-14-081	1
4	O-ring	H021-24-005	1
5	Screw, M8 x 20mm	21807-2411	2
6	Washer, M8 shakeproof	21898-4010	2

Code No. 04-C105-20-004

To protect the pump against liquid droplets, fine dust, coarse particles or chemically active gases, a range of inlet traps is available - refer to ACCESSORIES for information.

Pump discharge (outlet)

The pump outlet connexion is suitable for connecting directly to the ISO or KF25 coupling systems or for muff coupling to 28mm external Øtube. Rubber or plastic hose can be used to carry away the effluent gas. A pack (Code No: 04-C105-20-004)) containing - Adaptor, 'C' clamp, centring ring (KF25), O-ring, screw (M8) and washer (M8) - is supplied separately. For assembly details, see Fig 5.

Note: To prevent vapour or oil mist being discharged to the surroundings, it may be necessary to pipe the exhaust externally. In this case, a catchpot should be employed to prevent condensate from the effluent pipe draining back into the pump - the Edwards Model CP 100 outlet catchpot is recommended for this application.
Refer to ACCESSORIES for ordering information.

Alternatively, an oil mist filter unit can be installed to eliminate oil mist and (if desired) recirculate the separated oil droplets back to the pump - a connexion for the oil return pipeline is provided on the pump -for details of recommended outlet mist filter (MF100), refer to ACCESSORIES.

Oil filling and checking

Remove the oil filler plug and fill the pump to a level which is visible within the sight glass range, using the recommended grade of Edwards oil. Replace the oil filler plug.

Note: During normal operation, the oil level must always be visible in the sight glass between the lower and upper limit level marks.

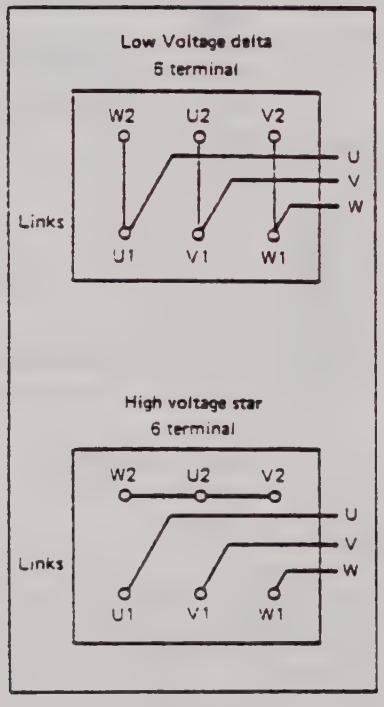
Electrical connexions

(a) Check that the mains supply voltage corresponds with the voltage specified on the motor data plate. Also check method of connexion ('Conn') - star or delta. Note: A starter fitted with overload protection will be required.

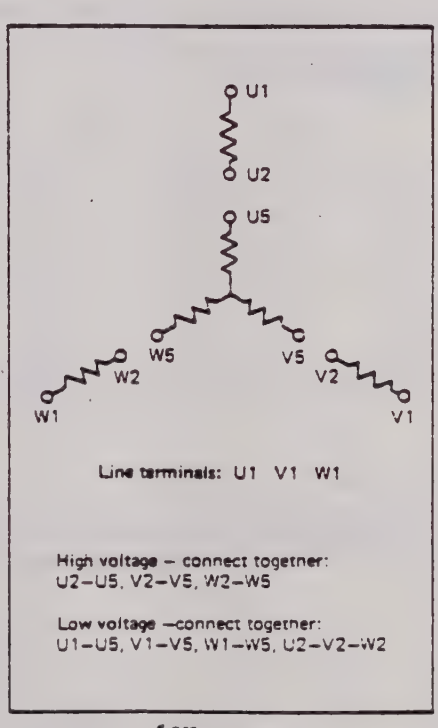
(b) Access to the motor terminals may be effected by removing the cover plate retaining screws. Thread the supply cables through the aperture in the motor casing and connect the cables to the terminals as indicated in the appropriate diagram (50Hz or 60Hz motor).

Direction of rotation

Anti-clockwise viewed from the motor end of the pump outfit.



50Hz motor



60Hz motor

Fig.6 ELECTRICAL CONNEXIONS

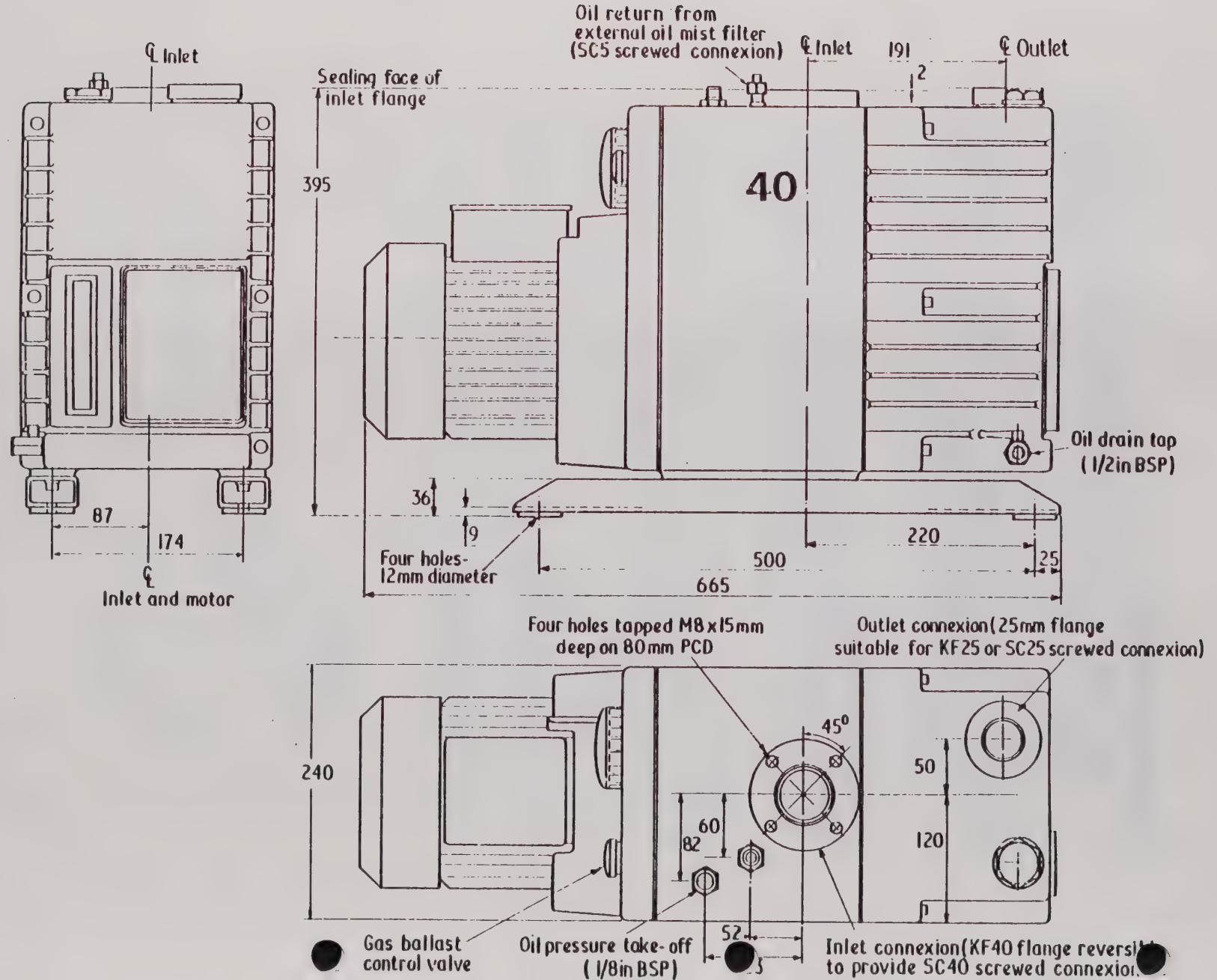


Fig. 7. Installation date EM40

03-A344-02-882

KS/20

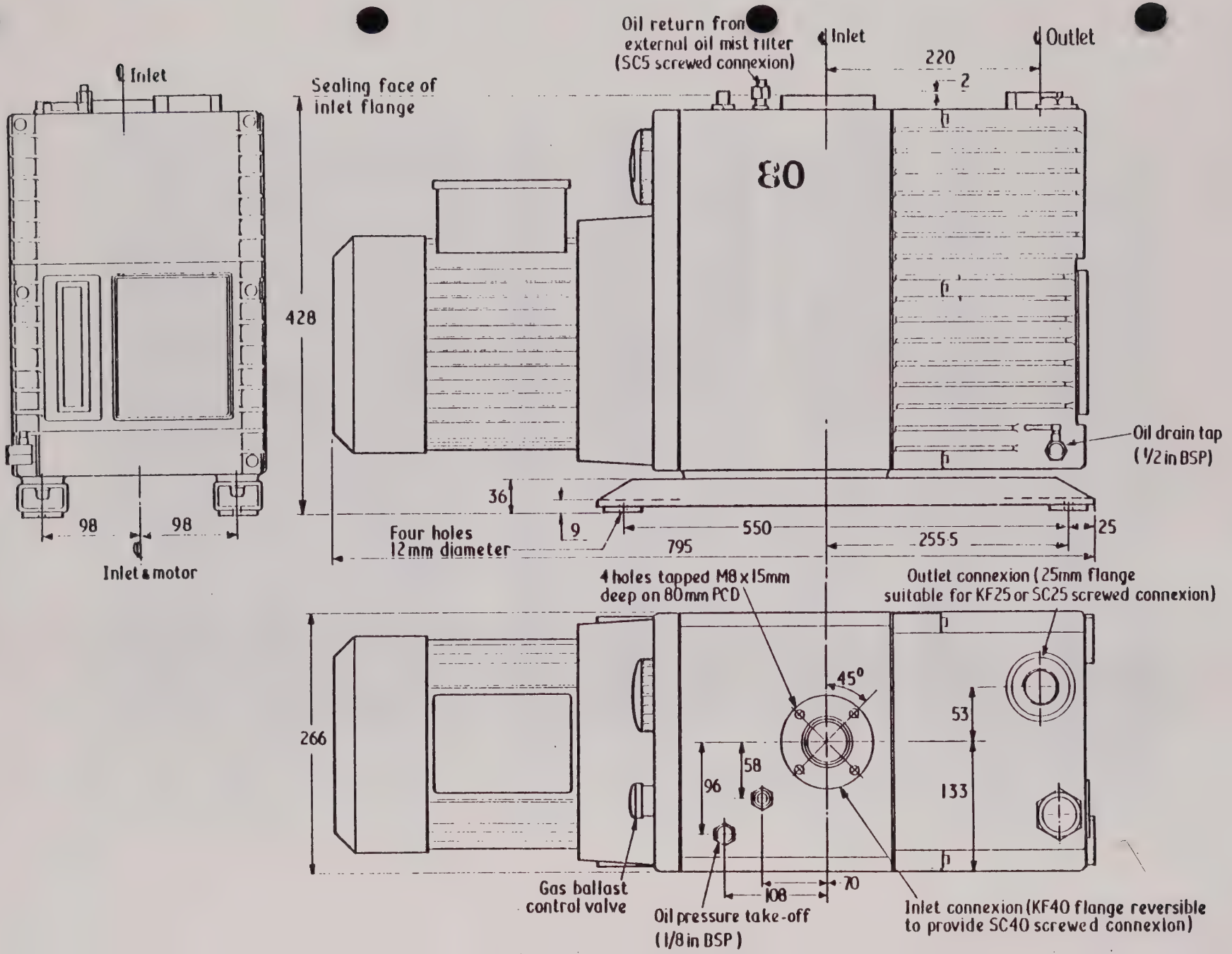


Fig. 8. Installation data EM80

03-A344-02-882

12/81

OPERATING NOTES

WARNING

ENSURE THE PUMP OUTLET IS NOT OBSTRUCTED. THIS MAY CAUSE DANGEROUS INTERNAL PRESSURE BUILD-UP

Start-up

(i) Before starting the pump, check that the oil level is visible in the sight glass. The pump will operate satisfactorily at this level during normal use.

(ii) Check direction of rotation - switch on the motor momentarily and ensure pump rotation is anti-clockwise viewed from motor (drive) end. If incorrect rotation - Switch off immediately and interchange any two of the phase leads.

Removal of condensable vapours

(i) When much condensable vapours are present in the system, gas ballast must be introduced into the pump by rotating the gas ballast valve in an anti-clockwise direction. The valve should be fully opened.

(ii) Before pumping vapours, the pump should be isolated from the system and allowed to run for approximately 30 minutes to warm the oil and assist in preventing vapour condensation in a cold pump.

Note: An inlet catchpot should be used when vapours condense in the vacuum line and can be carried towards the pump. The ITO1C0 inlet catchpot is recommended for this application.

(iii) On duties where copious amounts of water vapour must be pumped (e.g. certain drying processes) at pressure above saturation pressure at available cooling water temperature, the use of a water cooled condenser in association with a gas ballasted pump should be considered.The condenser will pump the main vapour load and protect the pump from gross ingress of vapour. The condenser can be valved out at a late stage in the process, so that the pump can complete the duty (e.g. drying process) down to a low residual water vapour pressure. For details of Edwards range of Vacuum Condensers, contact Edwards High Vacuum Sales Department.

(iv) If the pumps are being used in systems which evolve vapours or gases of a chemically aggressive or corrosive nature, the gas ballast flow may not completely protect the pump. In this case, use of the ITC100 chemical inlet trap or the external recirculatory oil filter (EOF300) may be indicated, or the use of a chemically inert pump oil may be advisable. Consult Edwards HV for advice.

(v) When pumping oil-soluble vapours, some contamination of the pump oil is inevitable. This can be reduced by increasing the pump temperature, by heat insulation of the pump casing or by increasing the amount of gas ballast. High temperature also assists in purging the oil at the end of the pumping duty.

(vi) After pumping large quantities of vapour, it is recommended that the pump is isolated from the system and run for at least 30 minutes with maximum gas ballast flow. This particularly applies after corrosive or oil soluble vapours have been pumped. During any pause in actual pumping duty, the pump can be advantageously employed in purging the oil by this method.

Ingress of dust

If there is any likelihood of solid particles from the vacuum system entering the pump, an ITF100 or ITM100 inlet filter should be fitted. For details of these and above-mentioned traps, refer to ACCESSORIES, page 16.

Ultimate vacuum

When measuring ultimate vacuum, it should be noted that the pump oil may have a vapour pressure which is higher than that of the permanent gases in the evacuated system. Gauges of the Pirani type measure the total pressure of permanent gases and vapours and will register differently from gauges of the McLeod type which will only indicate the pressure of the permanent gases.

To achieve highest vacuum when the pump has been filled with fresh oil, it is recommended that the pump is run on full gas ballast for some time. this has the effect of purging the oil and improves the ultimate vacuum.

Shut-down

The spring loaded distributor valve provides oil and air suck-back protection. When the pump stops for any reason, the valve will close in a mode which seals off the main pumping chamber under vacuum.

*On single stage pumps a permanent air suck back is not ensured unless a magnetic valve is introducted into the gas ballast port.

The pump is of rugged construction, designed for long term, trouble-free service, provided the recommended operating and servicing procedure is adhered to. Before despatch, each pump is inspected and tested for performance. Many cases of suspected failure or poor pump performance are in fact due to leakage in the vacuum system, faulty gauges or unsuspected contamination of the pump oil, and any such possibilities should be carefully checked.

Standard and low temperature lubricants

Edwards No.15 oil is recommended for all standard pumping duties.

Edwards No.17 oil provides protection against corrosion when pumping large amounts of water vapour but ultimate vacuum is somewhat less good than when using No.15 oil.

Both No.15 and No.17 oils should permit satisfactory starting at temperatures down to 5°C.

Should ambient conditions lower the pump temperature below 5°C then Shell Tellus T37 (or T27) is recommended. Since Tellus oils contain polymers which may be gradually degraded by the pumping mechanism, they will become gradually thinner during usage. More frequent oil changing is, therefore, recommended than when our standard oils are used, the frequency being assessed by service experience in a particular duty.

Chemically resistant lubricants

When oxygen is pumped, a chemically inert and stable pump oil must be used. Oils of this category can also be used advantageously where chamically aggressive gases and vapours may enter the pump. Suitable members of the range of synthetic oils known as 'FOMBLINS' have excellent properties for these applications. Fomblins are fully flourinated perflouropolyethers and are non toxic. They are practically inert chemically and have no flash point or fire point.

FOMBLIN YVAC 06/6 - its use in rotary pumps

Since it is a fully flourinated fluid, Fomblin is inert to most reactive chemicals such as UF_6, F_2, oxygen, ozone etc. It also has the unusual property that Fomblin vapour in a high vacuum system does not polymerise and form solid deposits when subjected to electron and most ion bombardment. For this latter reason, it is sometimes used in rotary pumps where back migration of hydrocarbon vapour into a diffusion pump must, at all costs, be avoided.

The major growth in its use as a rotary pump oil has been for the pumping of oxygen and in applications where hostile conditions are encountered which quickly destroy normal hydrocarbon pump oils. The corrosion resistant properties and chemical inertness of Fomblin result in greatly increased operational times between oil changes or pump maintenance and it provides a cost effective solution to many difficult pumping problems.

It is worth noting that Fomblin is inactive to amines, does not hydrolse to form hydrochloric acid and is insoluble in most inorganic solvents. This is in contrast to the fluoro-chloro oils. However, as in all new technology, practice becomes tempered with experience. Edwards work on Fomblin and our close contact with the field have led to two practical points which must be considered for the successful use of Fomblin in rotary pumps.

Firstly, corrosive material (such as mineral acids) which pass through the pump can then remain floating on the top of the Fomblin if the pump outlet is in any way restricted. A slightly negative pressure on the oil box would more effectively remove them from this area. Although it has not been quantified, there is strong evidence that the non-miscibility of Fomblin with corrosive materials allows it to protect the surfaces of the pump.

Secondly, as a result of its non solubility and extreme resistance to nearly all chemical materials, it has no detergent action, unlike mineral oils. Thus, particulate material (dust) carried over from the system to be exhausted can easily deposit out in the rotary pump resulting in a seizure. Except under gross conditions, this is more likely to show itself as an inability to restart rather than a catastrophic seizure during running. To combat this, Edwards has produced a range of in-line filters to be placed between the system and the rotary pump. These remove particles down to 2 microns and will protect the pump from this hazard. Thus, if a dirty system is being pumped with a Fomblin charged rotary pump, it is strongly recommended that such a filter should be fitted.

With proper consideration of the application and the appropriate precautions, Fomblin provides an excellent solution to the pumping of otherwise difficult substances. If a new process is being considered and there is some doubt, please consult Edwards High Vacuum for technical and cost feasibility of using Fomblin, the latter aspect should be particularly considered where large capacity pumps are involved.

SERVICING

1. Routine servicing

The following routine servicing only will be necessary:

Daily - Check pump oil level - this should be visible in the sight glass between the lower and upper level marks.

After initial 100 hours running - Change oil

Every six months (i) - *Change oil. Refer to para. 2 for procedure.

(ii) - *Change fine oil filter. Refer to para. 3 for procedure.

(iii) - Clean gas ballast filter. Refer to para. 4 for detailed procedure.

*Note: More frequence oil changing will be necessary if the pump is used in contaminated or 'dirty' systems.

The oil filter may also need replacing more frequently.

2. Oil changing

Note: Oil drainage will be facilitated if the pump is run for a few minutes to warm the oil.

Open the drain valve in the base of the oil box and allow oil to drain completely into a suitable receptacle. If the oil is dirty or contaminated, it is recommended that the pump is thoroughly flushed through with clean oil prior to re-filling. A filler plug is provided on top of the oil box.

Note: It is recommended that the internal strainer/filter positioned in the inlet port is removed and cleaned at each oil change. To gain access to the filter - detach the inlet flange. Clean the filter by washing in GENKLENE or alternative cleaning fluid (see page 19).

The opportunity should also be taken to examine the condition of any external filters or traps (if fitted). Refer to instructions supplied with accessory for servicing procedure.

3. To change the fine oil filter

Note: The pump must be switched off during this operation. It is recommended that the pump oil is also changed with the filter.

(i) Prior to removing the filter, position a suitable receptable underneath the drain scoop which is located below the filter body. This will contain the oil released on removal of the filter (about 400ml).

(ii) The filter can be removed by unscrewing the filter body (anti-clockwise) - use a suitable strap spanner, if necessary. Unscrew the filter body slowly to avoid too rapid release of oil.

(iii) When the filter is clear of the housing, empty residual oil in body into receptacle. Clean off any oil spillage from pump surfaces and filter housing.

(iv) Discard the complete filter pack and fit replacement filter (Code No. 14-A223-04-087). Screw home filter in housing and tighten securely.

4. Cleaning the gas ballast filter

To gain access to the ballast filter remove the retaining screws from the ballast valve bearing . Withdraw the bearing and the filter from the valve body then remove any dust or grit from the filter using a pressurised air line. If the filter is contaminated with dirt or oil then washing in warm soapy water or mild solvent (such as GENKLENE) is recommended. The filter must be thoroughly dried after washing.

Note: When re-assembling the filter, ensure chamfered end faces outwards.

SPARES

Spares kit comprising:	Ordering No.	
	14-A344-01-800 (E1M40)	14-A364-01-800 (E2M40)
Blades, springs, seals, gaskets, filters, washers	14-A345-01-800 (E1M80)	14-A365-01-800 (E2M80)
Complete interior assembly:	14-A344-01-100 (E1M40)	14-A364-01-100 (E2M40)
	14-A345-01-100 (E1M80)	14-A365-01-100 (E2M80)
Edwards No. 15 oil (5 litres)	09-H110-02-013	
Edwards No. 17 oil (5 litres)	09-H110-04-013	

HERMETICALLY SEALED ROTARY PUMPS

The hermetically sealed (HS) pumps are specially modified versions for pumping very pure and very precious gases and incorporate the following features:

1. Denoted by 'HS' stamped on the label; (after the model number).

2. Front shaft oil seal is replaced by two metal-cased seals positioned in the pump housing. The space between the seals is maintained full of oil which is fed from a reservoir positioned in the housing for the gas ballast assembly.

3. Fine pore oil filter is removed and the oil feed drilling blanked off.

4. Oil filler plug and oil drain valve replaced by blanked vacuum unions.

5. Oil box gaskets are made from nitrile material.

Installation

Note:

The oil level in the reservoir must be maintained at the level mark shown, i.e. just below the vent plug.

Spares kit for HS version	Ordering No.
E1M40HS	A34405800
E1M80HS	A34505800
E2M40HS	A36405800
E2M80HS	A36505800

ACCESSORIES

A fully comprehensive series of accesories is available for the EM range of pumps as shown in Fig. 7; these comprise:

Inlet Traps

ITO100 - Inlet Catchpot to trap liquid droplets - prevents any liquid content from the gas load reaching the pump.
Ordering No: 04-A4411-02-000 (Supplied with KF40 centring ring and O-ring, screws and washers).

ITF100 - Inlet dust filter - to protect the pump against abrasive dust; incorporates nylon filter element. Should be selected where dust concentrations are moderate.
Ordering No: 04-A442-02-000 (Supplied with KF40 centring ring and O-ring, screws and washers).

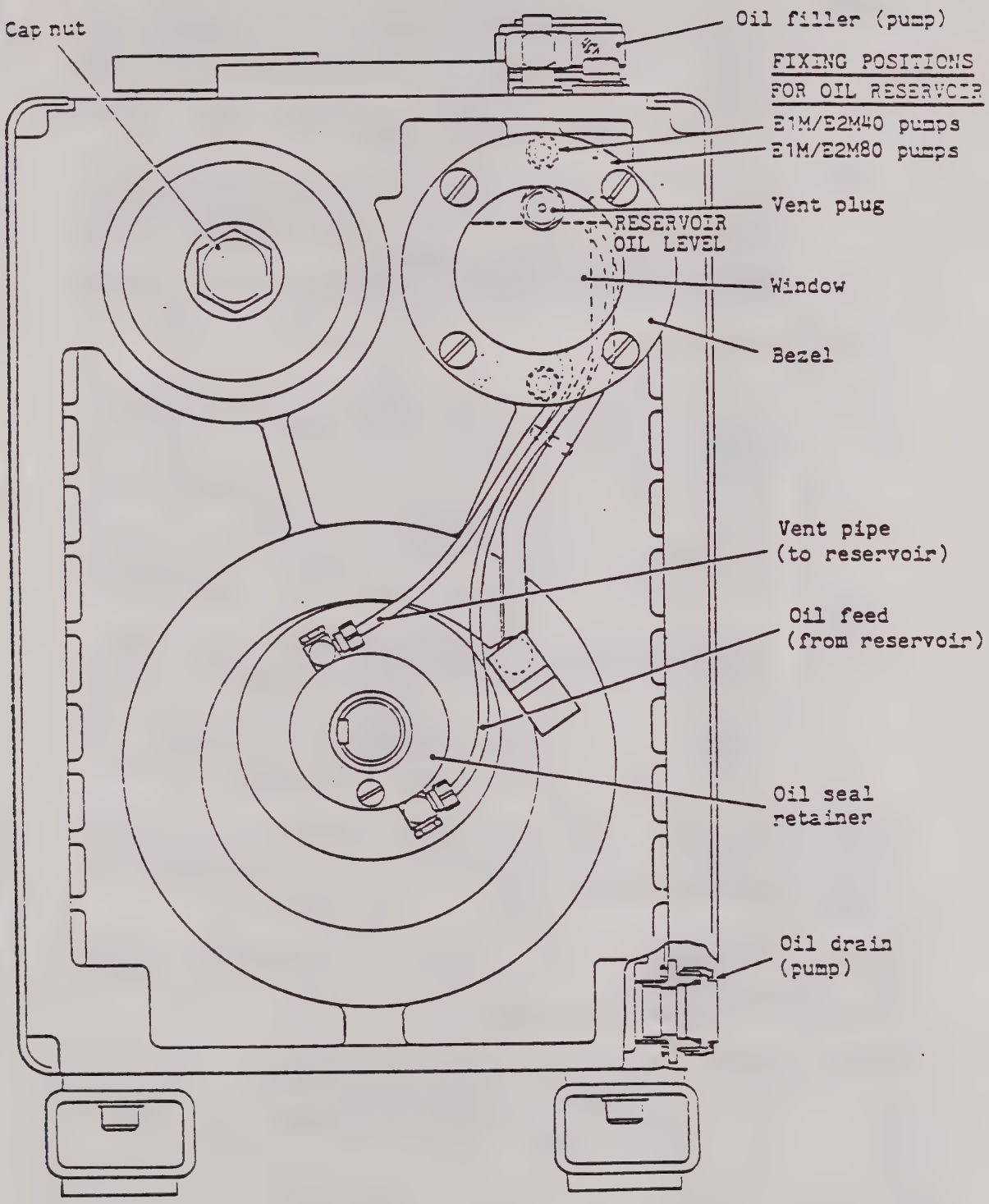


Fig.9 E1M/E2M40 AND 80 HERMETICALLY SEALED PUMPS

ITM100 - High capacity inlet dust filter with mesh element - for use where heavy concentrations of dust are encountered and which would necessitate too frequent cleaning of the ITF model.
Ordering No: 04-A443-02-000 (Supplied with KF40 centring ring and O-ring, screws and washers).

ITC100 - Inlet Chemical Trap - to protect against chemically active gases - incorporates basket to contain trapping material appropriate to the duty (e.g. activated charcoal to trap heavy vapours etc.).
Ordering No: 04-A444-02-000 (Supplied with KF40 centring ring and O-ring, screws and washers).

Outlet Catchpots/Filters

CP100 - Outlet Catchpot - installed when pump outlet is piped for remote discharge - prevents any vapour condensed in pipeline from draining back to pump.
Ordering No: 04-A461-03-000 (Supplied with two SC25 'C' clamps SC25 elbow, two SC25 O ring carriers and O rings, screws, washers, mounting bracket and studs).
Note: On certain applications, the higher trapping capacities of the larger CP300 model may be indicated (a special adaptor flange is available to suit this model).

MF100 - Outlet Mist Filter - to prevent oil mist being discharged to the surroundings - separates and traps oil droplets in pump discharge. Trapped oil can be recirculated to pump, if required.
Ordering No: 04-A462-03-000 (Supplied with two SC25 'C' clamps, SC25 elbow, two SC25 O ring carriers and O rings, screws, washers, mounting bracket and studs).

External Oil Filter - EOF300 external (free-standing) filter - uses activated earth to remove acidic contaminants and break-down products from oil. Supplied with flexible hose and unions.
Ordering No: 04-A500-03-000

Vibration Isolators - to reduce transmission of vibration and noise when pump is floor mounted or on frame structure and to prevent strain when mounting site is not level.
Ordering No: 04-A248-01-405 (set of 4)

Flexible Bellows - SC25 flexible bellows for outlet
Ordering No: 08-C110-04-442
- SC40 flexible bellows for inlet
Ordering No: 08-C110-05-442

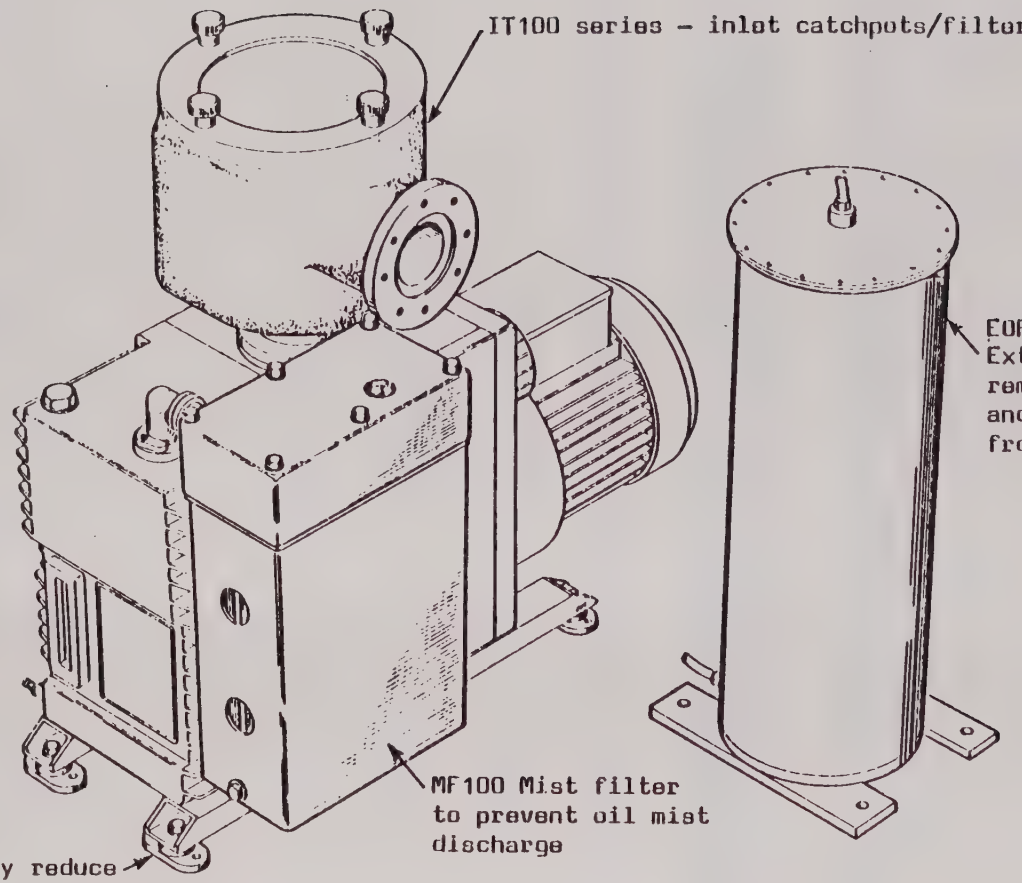


Fig.10 EM40, EM80 SERIES PUMPS WITH ACCESSORIES

E2M40S - E2M80S

SUPERPUMPS

PARTS LIST FOR E2M40S SUPERPUMP

ITEM NO.	CODE NO.	DESCRIPTION	QUANTITY
1	A22305050	Filter assembly	1
2	A27876010	Valve pipeline assembly	1
3	A22305035	Filter assembly (inlet)	1
4	A26401039	Rotor assembly	1
5	A26401040	Rotor assembly LV	1
6	A36413012	Gas ballast tube	1
7	A36413013	Oil feeder adaptor	1
8	A36413014	Gauge adaptor	1
9	A36413015	Valve body	1
10	A36413016	Clamp	1
11	A36413017	Non return valve plug	1
12	A36413018	Spring housing	1
13	A36413019	Jet	1
14	A36413020	Restrictor	1
15	A36401001	Front bearing	1
16	A36401002	Stator HV	1
17	A36401030	Interstage	1
18	A36413024	Side panel	1
19	A36401027	Oil box	1
20	A36401008	Motor mounting	1
21	A36401024	Inlet flange	1
22	A20405009	Sleeve	1
23	A36401012	Stator LV	1
24	A36401013	End cover	1
25	A34301037	Distributor weight	1
26	A36413010	Adaptor	1
27	A26501036	Valve pad	2
28	A00307046	Spring	4
29	A25988006	Blanking plate	1
30	A01403030	Filter seal	1
31	A26002010	Plug 1/8in BSP	1
32	-	Motor (see label)	1
33	A26401064	Rotor H.V.	1
34	A27102016	Spring	2
35	A27229001	Ballast plug	1
36	A36413011	Shaft seal housing	1
37	A27840017	Pipeline	1
38	A27840018	Pipeline	1
39	A20001063	Label	1
40	A27911012	Banjo bolt	1
41	A28703007	Solenoid valve	1
42	A_0402101	Blade LV	2
43	A20404011	Roller bearing	2
44	A20402152	Blade HV	2
45	A20416002	Sight glass bezel	1
46	A20499019	Base runner	2
47	A36413021	Mounting plate	1
48	A22301003	Fan	1
49	H02109084	Oil seal	1
50	A22305041	Ballast filter	2
51	H02120015	O-ring	1
52	H02120082	O-ring	1
53	A22404006	Support pillar	2
54	H03517003	Hollow taper pressure plug ¼in BSP	1
55	A22426004	Circlip	1
56	H03524007	Connector 1/8in BSP	1
57	H03524008	Connector ¼in BSP	1
58	A25970045	Baffle	2
59	H03517004	Hollow taper pressure plug 1/8in BSP	1
60	A25942008	Exhaust cover plate	1
61	182673102	PTFE tube	1
62	A25970036	Clamp (oil pressure line)	1
63	A25970038	Exhaust baffle LV	1
64	A36413022	Side panel	1
65	212402003	O-clip (7-9mm)	2
66	218091288	Screw M4	2
67	A25976006	Exhaust valve plate	1
68	A25976007	Exhaust valve plate LV	1
69	A26501012	Sight glass seal	1
70	A36413023	Oil pump housing	1
71	A25976033	Spray baffle	1
72	A27102013	Spring	1
73	A36413025	Washer	2
74	A27159415	Rubber seal	1
75	A20001082	Label - Fomblin	1
76	A27159514	Exhaust valve rubber	1
77	A27159515	Exhaust valve rubber LV	1
78	A27159629	Oil box gasket	1
79	A20402400	Oil pump blade	2
80	A27804004	Exhaust valve spacer	4
81	A27911003	Socket - 1/8in BSP	1
82	A28702003	Ball valve - ¼in BSP	1
83	A29201006	Sight glass	1
84	A29203002	Pin	4
85	A27192924	Spring	1
86	A21035072	Ballast block	1
87	A36501009	Inlet connexion	1
88	A21071045	Taper lock bush	1
89	A22404010	Spacer	2
90	A25970060	Clamp	1
91	A24301014	Key	1
92	A36501015	Distributor body	1
93	A36401019	Distributor sleeve	1
94	A36401028	Cap	1
95	A36401029	Spacer	1
96	A27876009	Oil pressure pipeline	1
97	A36401031	Filter clamp	1
98	A34421007	Ballast tube	1
99	C10501100	KF16 x ¼in BSP adaptor	1
100	C10512001	Clamp KF16/10	1
101	C11001064	Blind tailpiece	1
102	H02109052	Oil seal	1
103	H02124003	O-ring	1
104	B21023019	Protective cover	1
105	B21024001	Dust cover	1
106	H03524006	Elbow - 1/8in BSP	1
+107	H03524009	Adaptor	2

PARTS LIST FOR E2M40S—SUPERPUMP

ITEM NO.	CODE NO.	DESCRIPTION	QUANTITY
+108	H03524010	Elbow - ¼in	2
109	C11001180	Adaptor -1/8in BSP	1
110	218091329	Screw M5	3
111	218091334	Screw M5	4
112	218091370	Screw M6	2
113	H01503006	Cap	1
114	H01503333	Cap - ¼in BSP	1
115	H02104001	Seal - 1/8in BSP	2
116	H02104008	Seal - 1in BSP	1
-	-	-	-
119	H02120027	O-ring	1
120	H02120031	O-ring	1
121	-	-	-
122	H02120057	O-ring	1
123	H02120082	O-ring	1
124	H02120097	O-ring	1
125	-	-	-
126	H021250200-ring	1	
127	H02125044	O-ring	2
128	H02125115	O-ring	2
129	H02125116	O-ring	2
130	-	-	-
131	H03517002	Plug ¼in	2
132	-	-	-
133	H03400008	Union nut - 3/8in BSP	1
-	-	-	-
137	H02109064011 seal	1	
138	-	-	-
139	A21071033	Flexible component	1
140	A21071037	Coupling flange	1
141	A21071038	Coupling flange	1
142	A21071039	Taper lock bush	1
-	-	-	-
145	211174099	Spring pin	1
146	211430301	Rivet	4
147	212170186	Spring pin	2
148	212181081	Dowel	2
149	212192021	Taper pin	4
150	212192026	Taper pin	2
151	-	-	-
152	218002339	Screw M5	1
-	-	-	-
161	218042287	Screw M4	2
162	218042328	Screw M5	15
-	-	-	-
165	218072409	Screw M8	2
-	-	-	-
168	218091328	Screw M5	4
169	218091330	Screw M5	8
170	-	-	-
171	218091369	Screw M6	8
172	218091370	Screw M6	2
173	218091371	Screw M6	3
174	218091411	Screw M8	8
175	218091412	Screw M8	21
176	218091415	Screw M8	4
177	218091417	Screw M8	4
178	218091421	Screw M8	6
179	218091453	Screw M10	1
180	218121449	Screw M10	1
181	-	-	-
182	218790005	Eyebolt M12	2
-	-	-	-
187	218980210	Washer	4
188	218985810	Washer M8	6
189	218990201	Washer	1
190	-	-	-
191	A20001084	Label	1
192	E20001063	Label	1
193	A20001085	Label	1
-	-	-	-
*198	H11002013	No.15 oil - 5 litres	1
*199	C10520004	NW25/tube pack (exhaust)	1
*200	A36401025	Inlet pack	1
-	-	-	-
**205	H02109065	Spiroseal	1
**206	H02109075	Seal	1

*NOT SHOWN
**HYDROCARBON E1M40/E2M40 PUMPS ONLY, IN PLACE OF ITEM 136
+SUPPLIED IN POLYTHENE BAG

03-A344-02-382
18/34

E2M40S and E2M80S (SUPERPUMPS)

INTRODUCTION

The E2M40S and E2M80S Superpumps are based on the highly efficient and successful standard E2M40 and E2M80 series of Edwards rotary vacuum pumps. The Superpump range differ from the standard models in that modified internal parts have been introduced to ensure reduced maintenance down time and an increase in the running efficiency of the pumps.

These new pumps have a novel feature in that Dry Nitrogen (N_2) is introduced through the space between the PTFE oil seals thus causing purging of the interspace and preventing Fomblin oil loss, this action will provide considerably extended periods between servicing.

Also, incorporated into the oil system is the return of oil from an external oil filter (E0F102FS for system build) fed directly to the inlet side of the vacuum pumps own oil pump thus ensuring a continuous supply of clean filtered oil to the internal working mechanism.

Purpose of dry N_2 ballasting

The introduction of dry N_2 into the gas ballast during operation of the pump is to prevent the majority of any corrosive gases condensing during the compression cycle of the pump also to dilute the same in the oil box. This form of gas ballasting is also used to lightly pressurise the PTFE shaft seals to assit in preventing any leakage of Fomblin oil. Although Fomblin oil has an excellent low surface tension ability it will seek out even the most minor shaft seal deficiences, any such Fomblin oil leakage will be carried by the dry N_2 back into the pump via the gas ballast. In fact, the positive pressure in the seal interspace tends to push the Fomblin oil back thereby suppressing any minor leaks.

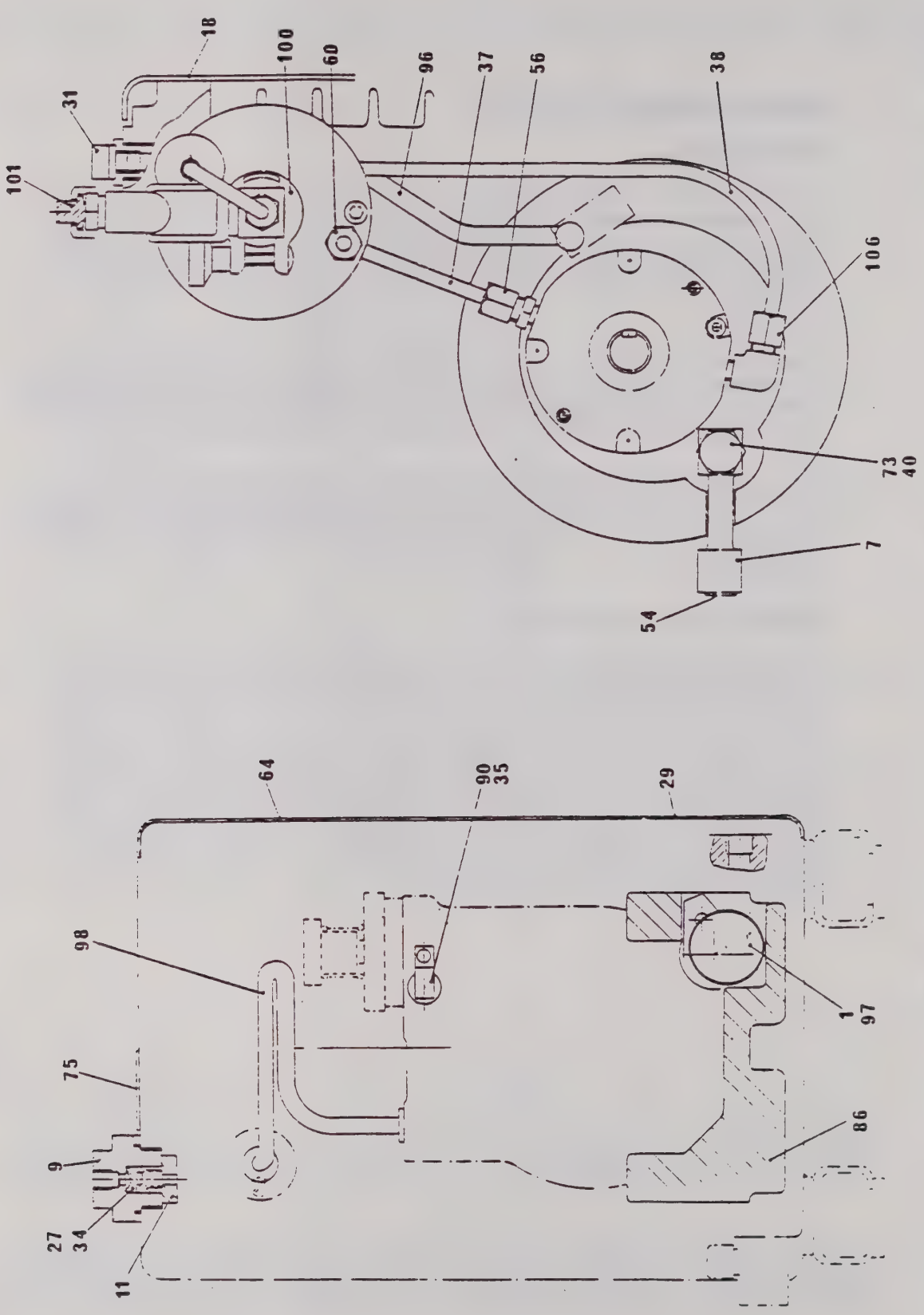


Fig.11 Dry N_2 Installation (E2M40S)

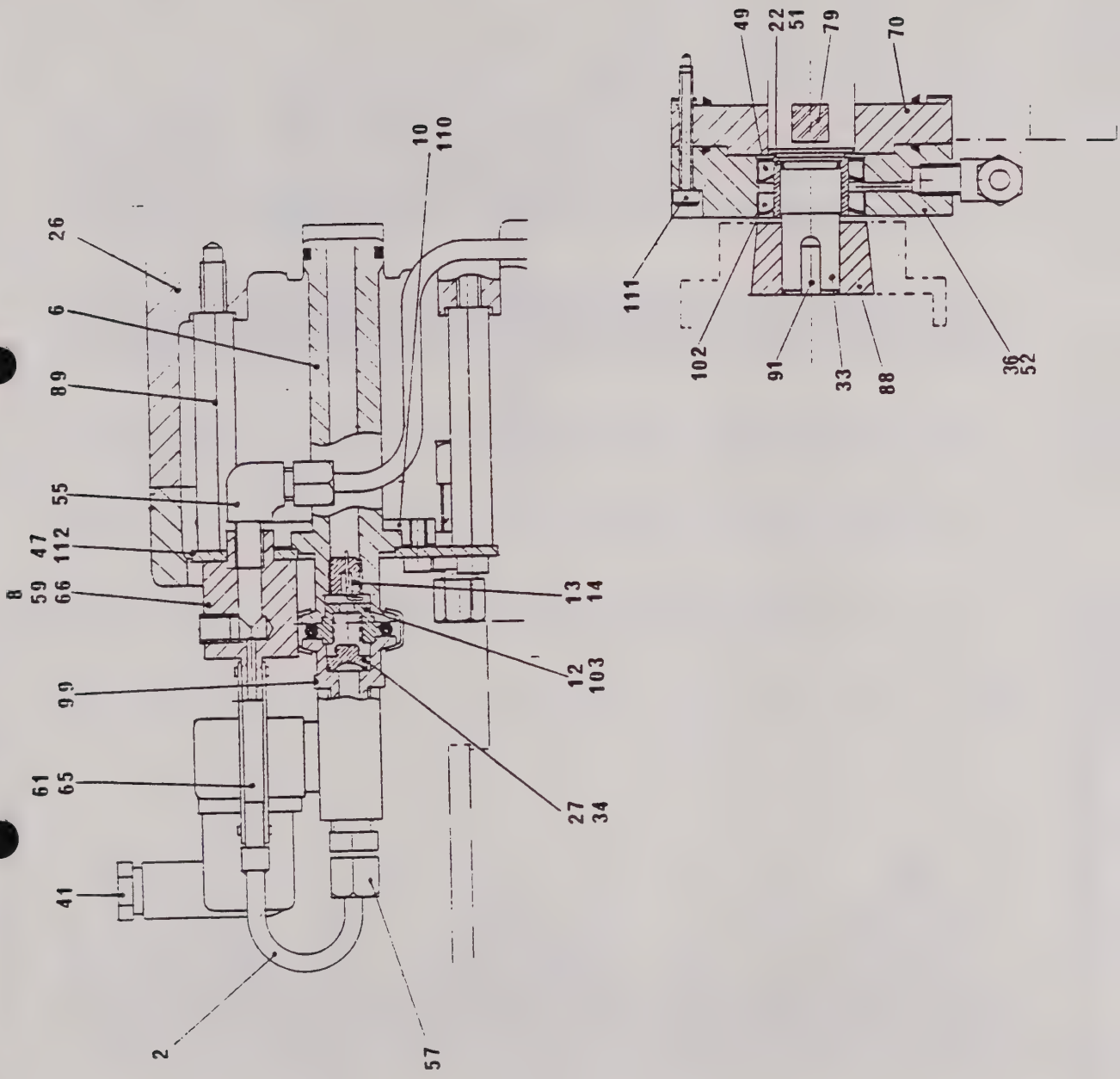


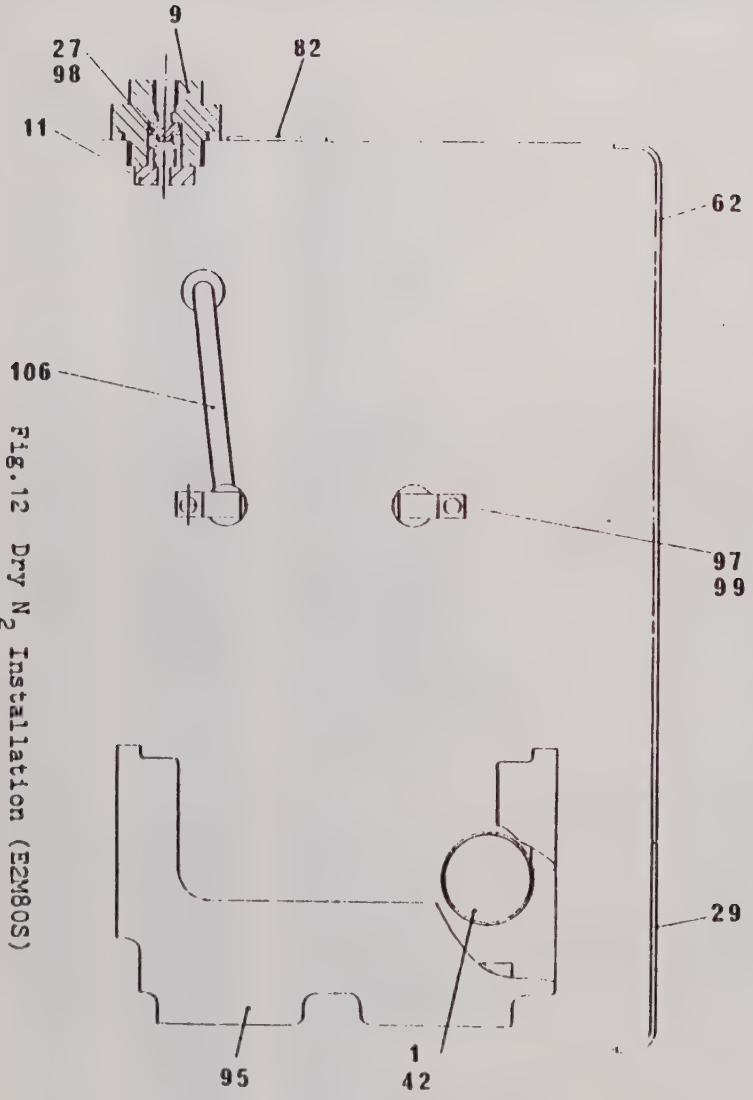
Fig.11a Dry N_2 Installation (E2M40S)

PARTS LIST FOR E2M80S—SUPERPUMP

ITEM NO.	CODE NO.	DESCRIPTION	QUANTITY
1	A22305050	Filter assembly	1
2	A27876010	Valve pipeline assembly	1
3	A22305035	Filter assembly (inlet)	1
4	A36513010	Adaptor	1
5	A26401042	Rotor assembly LV	1
6	A36413012	Gas ballast tube	1
7	A36513011	Oil feed adaptor	1
8	A36413014	Gauge adaptor	1
9	A36413015	Valve body	1
10	A36413016	Clamp	1
11	A36413017	Non return valve plug	1
12	A36413018	Spring housing	1
13	A36413019	Jet	1
14	A36413020	Restrictor	1
15	A36501001	Front bearing	1
16	A36501002	Stator HV	1
17	A36501035	Interstage	1
18	A36501005	Stator LV	1
19	A36413025	Washer	2
20	A36501034	Oil box	1
21	A36501027	Motor mounting	1
22	A36501009	Inlet connexion	1
23	A36501032	Inlet flange	1
24	A21071045	Taper lock bush	1
25	A22404010	Spacer	2
26	A36413011	Shaft seal housing	1
27	A26501036	Valve pad	2
28	A36501015	Distributor body	1
29	A 5988008	Blanking plate	1
30	A26401069	Rotor HV	1
31	A26002010	Plug 1/8in BSP	1
32	A36501021	Cover plate	1
33	A24301014	Key	1
34	A36501024	Drive member	2
35	A36401029	Spacer	1
36	A36401019	Distributor sleeve	1
37	A34301037	Distributor weight	1
38	A27840020	Pipeline (2)	1
39	A01403074	Plug 1/8in BSP	1
40	A00307046	Spring	5
41	A01403030	Filter seal	1
42	A36401031	Filter clamp	1
43	-	Motor (see label)	1
44	C10501100	Adaptor - KF16 x ¼in BSP	1
45	C10512001	Clamp - KF16/10	1
46	A36401028	Cap	1
47	218091329	Screw M5	3
48	A19201007	Ballast piston	1
49	A20001063	Label	1
50	A20402087	Blade LV	2
51	A20402089	Blade HV	2
52	H02120082	O-ring	1
53	A20404012	Roller bearing	2
54	H03517003	Hollow taper pressure plug - ¼in BSP	1
55	A20416002	Sight glass bezel	1
56	A20499015	Base runner	2
57	H03524008	Conector ¼in BSP	1
58	A22301002	Fan	1
59	A36413021	Mounting plate	1
+60	H03524005	Bulkhead connector	1
+61	H03517004	Hollow taper pressure plug 1/8in BSP	1
62	A36513013	Side panel	1
63	182673102	PTFE tube	1
64	A22426004	Circlip	1
65	212402003	O-clip	2
66	218091288	Screw M4	2
67	A24301013	Key	1
68	218091334	Screw M5	4
69	218091370	Screw M6	2
70	A25942005	Exhaust cover plate	1
71	A36413023	Oil pump housing	1
72	A25970034	Exhaust baffle LV	1
73	A25970035	Clamp (oil delivery line)	2
74	A25970036	Clamp (oil pressure line)	1
75	A36513012	Side panel	1
76	H03524007	Connector 1/8in BSP	1
77	A25976002	Exhaust valve plate LV	1
78	A25976005	Exhaust valve plate	1
79	A26501012	Sight glass bezel	1
80	A25976034	Spray baffle	1
81	A27102013	Spring	1
82	A20001082	Label - Fomblin	1
83	A27159415	Rubber seal	1
84	A27159504	Exhaust valve rubber LV	1
85	A20402400	Oil pump blade	2
86	A27159509	Exhaust valve rubber	1
87	A27159618	Oil box gasket	1
88	A20405009	Sleeve	1
89	A27804004	Exhaust valve spacer	6
90	A27911003	Sokcet - 1/8in BSP	1
91	A29201006	Sight glass	1
92	A29203002	Pin	5
93	A28702003	Ball valve - ¼in BSP	1
94	A27102024	Spring	1
95	A21035064	Ballast block	1
96	A25970046	Baffle	2
97	A25970060	Clamp	1
98	A27102016	Spring	2
99	A27229001	Ballast plug	1
100	A27840019	Pipeline (1)	1
101	A27876006	Oil pressure pipeline	1
102	A27911612	Banjo bolt	1
103	A28703010	Solenoid valve	1
104	B21023019	Protective cover	1
105	B21024001	Dust cover	1
106	A27876004	Ballast tube	1
107	C11001064	Blind tailpiece	1
108	C11001062	Blind tailpiece	1

ITEM NO.	CODE NO.	DESCRIPTION	QUANTITY
109	C11001180	Adaptor - SCE x 1/8in BSP	1
110	H02109052	PTFE oil seal	1
111	H02109084	PTFE oil seal	1
112	H02120015	O-ring	1
113	H02124003	O-ring	1
114	H01503333	Cap - ¼in BSP	1
115	H02104001	Seal - 1/8in BSP	2
116	H02104008	Seal - 1in BSP	1
117	H03524006	Elbow - 1/8in BSP	2
118	-	-	-
119	H02120072	O-ring	1
120	H02120031	O-ring	1
121	-	-	-
122	H02120057	O-ring	1
123	H02120082	O-ring	1
124	H02120101	O-ring	1
125	-	-	-
126	H02125020	O-ring	1
127	H02125044	O-ring	2
-	-	-	-
131	H03517003	Plug - ¼in BSP	2
132	-	-	-
133	M03400008	Union nut - 3/8in BSP	1
-	-	-	-
139	A21071033	Flexible component	1
140	A21071037	Coupling flange	1
141	A21071035	Coupling flange	1
142	A21071039	Taper lock bush	1
143	A21071040	Taper lock bush	1
144	-	-	-
145	211174099	Spring pin	1
146	211430301	Rivet	4
147	212170186	Spring pin	2
148	212181041	Dowel	2
149	2.2192021	Taper pin	2
150	212192026	Taper pin	4
151	-	-	-
152	218002339	Screw M5	1
-	-	-	-
161	218042287	Screw M4	2
162	218042328	Screw M5	15
-	-	-	-
165	218072409	Screw M8	2
-	-	-	-
168	218091328	Screw M5	5
169	218091330	Screw M5	8
170	-	-	-
171	218091369	Screw M6	6
172	218091370	Screw M6	2
173	218091371	Screw M6	8
174	218091411	Screw M8	8
175	218091412	Screw M8	23
176	218091421	Screw M8	6
177	218091415	Screw M8	7
178	218121449	Screw M10	1
-	-	-	-
182	218790009	Eyebolt M12	2
187	218980210	Washer M8	4
188	218982710	Washer M8	6
189	218990201	Washer	1
190	-	-	-
191	A20001084	Label	1
192	E20001063	Label	1
193	A20001085	Label	1
-	-	-	-
*197	H11002014	No.15 oil - 2½ litres	1
*198	H11002013	No.15 oil - 5 litres	1
*199	C10520004	NW25/tube pack (exhaust)	1
*200	A36401025	Inlet pack	1
-	-	-	-
**215	H02109065	Spiroseal	1
**216	H02109075	Seal	1

*NOT SHOWN
**HYDROCARBON PUMPS ONLY IN PLACE OF ITEM 136
+SUPPLIED IN POLYTHENE BAG



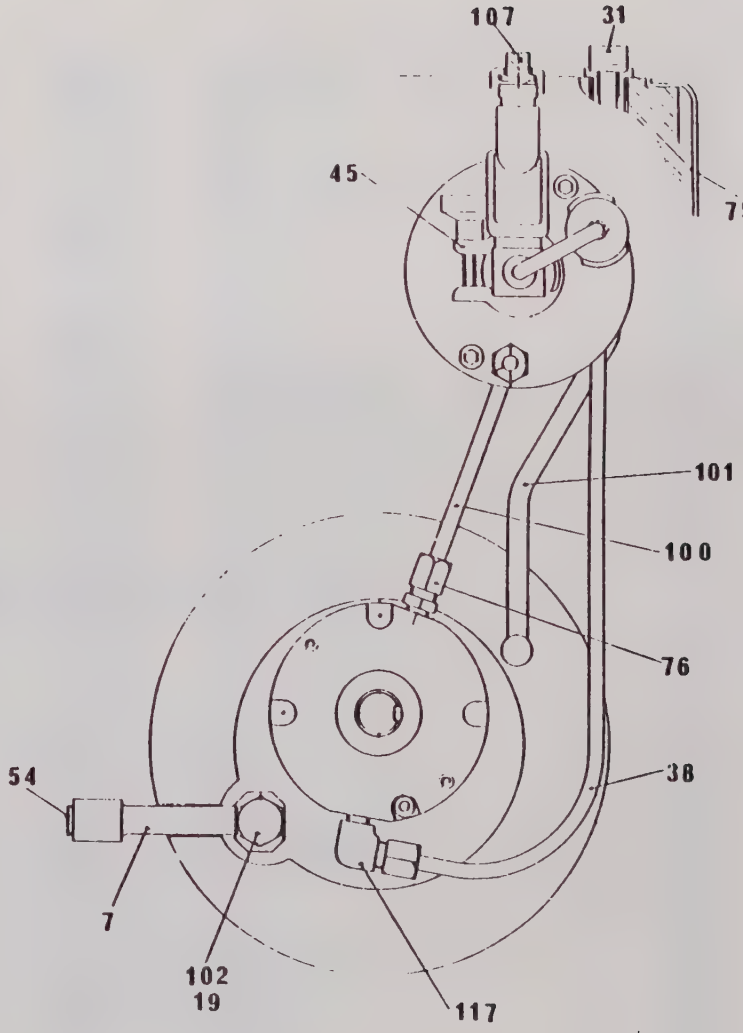


Fig.12 Dry N_2 Installation (E2M80S)

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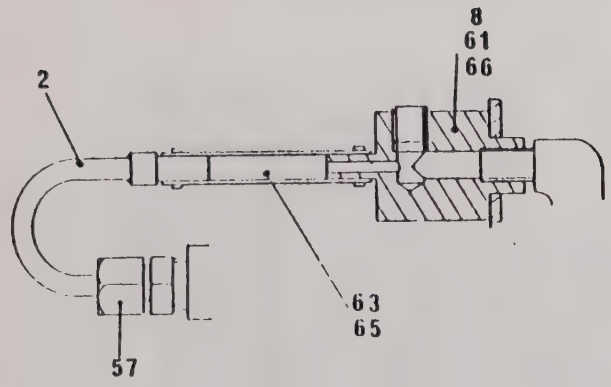


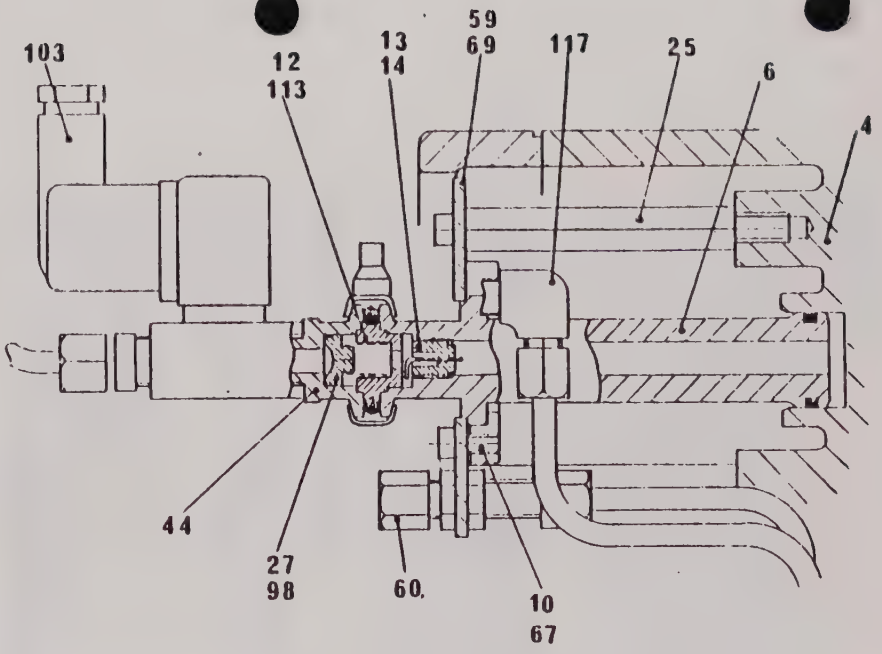
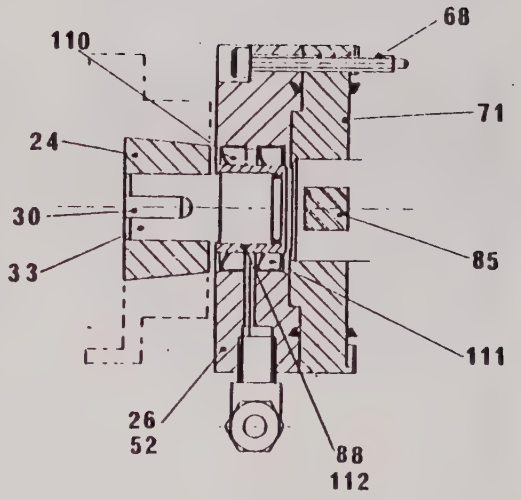
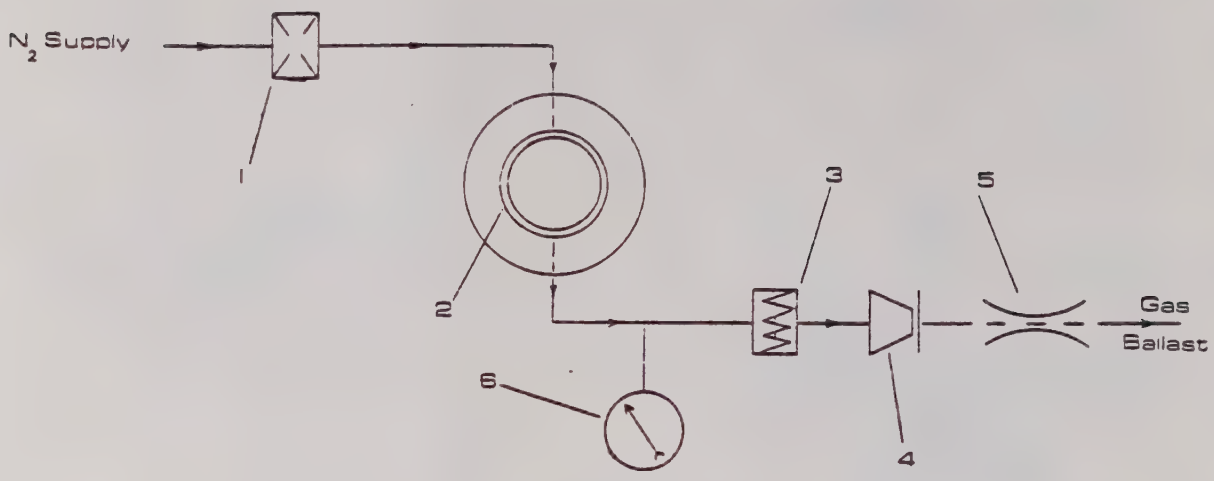


Fig.12a Dry N_2 Installation (E2M80S)





1. Inlet connexion
2. Shaft seal interspace
3. Magnetic solenoid valve
4. Non-return valve
5. Fixed restrictor
6. p2 Pressure gauge

Fig.13 Dry N_2 flow diagram

WORKING PRINCIPLE OF DRY NITROGEN BALLASTING

NOTE: Bracketted numbers refer to Figs.11-11a and 12-12a respectively.

Dry N_2 is supplied to the inlet connexion* (60) and passed between the PTFE shaft seals which are located in the specially designed shaft seal housing (36) or (26) by way of an inlet pipeline (37) or (100). The dry N_2 lightly pressurises the PTFE shaft seal interspace (49 and 102) or (110 and 111) any slight leakage of Fomblin oil at this point will be entrained in the gas flow and fed back through a return pipeline (38). Any Fomblin oil in the return line would be visible through the clear PTFE tube (61) or (63) thus giving an indication of shaft seal leakage. A tapping in the return line adaptor (8) provides the facility for an in-line Vacuum/Pressure compound gauge. The gas flow now enters the non-return valve (9) via a magnetic solenoid valve (41) or (103), after passing through a fixed restrictor - to give maximum flow - the gas is fed into the gas ballast port.

*NOTE:- Recommended dry N_2 inlet pressure = 3 p.s.i.

SHUT DOWN

Edwards rotary vacuum pumps are ruggedly designed and constructed for endurance and continuous running under arduous conditions, it is not recommended that the pump be shut down except for major maintenance where it should be dismantled as quickly as possible as by continuous running the pump ensures that the pressurised oil feed washes the internal surfaces keeping any corrosive materials in suspension thereby preventing corrosive attack on any of the internal working surfaces.

However, in the event of a necessary shut down requirement the pump should be run continuously for several hours with the gas ballast ON until - through operators experience - the system has been thoroughly purged because if the pump is left in a contaminated condition certain corrosive and/or toxic materials may be present in the system (refer to the Health and Safety section).

HEALTH AND SAFETY ASPECTS

To prevent inhalation and skin contact during systems operation employing such materials of a toxic and/or irritant composition Edwards strongly recommend the adherence to Health and Safety precautions.

1. INHALATION

   a) Use approved face or mouth masks.
   b) Provide adequate change of air in operating areas.
   c) Provide adequate ventilation.

In the event of accidental inhalation remove subject to a fresh air enviroment.

2. SKIN CONTACT

   a) Wear full length coveralls with long sleeves which can be buttoned or secured, coveralls to be worn with the trouser bottoms outside of the footwear.
   b) Protective safe footwear to be worn.
   c) Full length protective gloves or gauntlets to be worn.
   d) Suitable head covering to be worn.

If skin rashes or irritating blemishes appear after inadvertent contact the subject should seek medical advice.

"NO SMOKING OR NAKED LIGHTS IN OPERATING AREAS"

TECHNICAL DATA AND SPECIFICATIONS

Superpump model			E2M40S	E2M80S
Displacement (swept volume)	50Hz	m^3h^{-1}	42.5	80
	60Hz	m^3h^{-1}	50.5	96

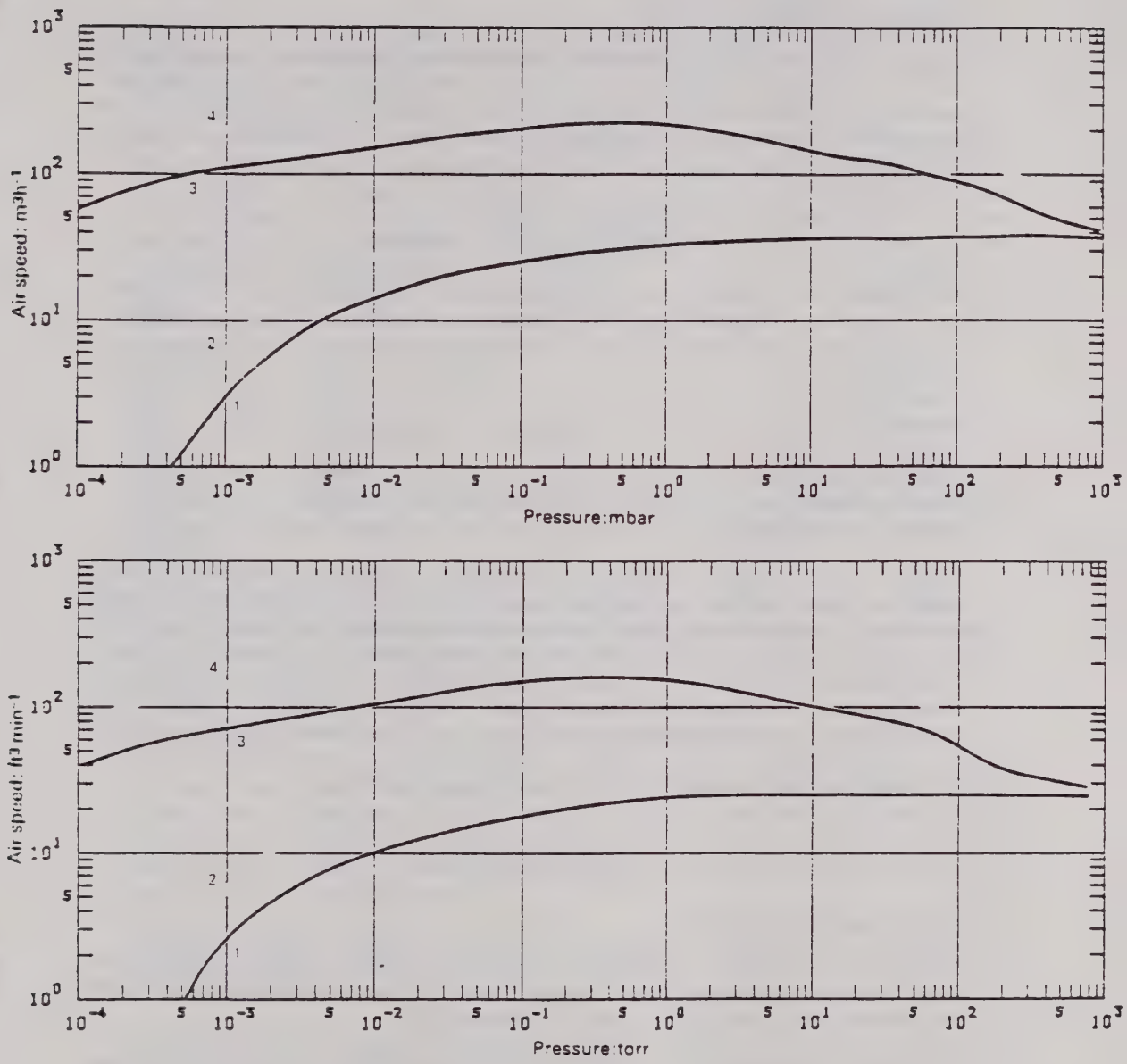
Ultimate vacuum (with Fomblin partial pressure)			
without gas ballast	mbar	2×10^{-3}	2×10^{-3}
with gas ballast	mbar	5×10^{-3}	5×10^{-3}
Gas ballast flow (max)	l/m	5-7	5-7
Nitrogen minimum flow	l/h^{-1}	500	500
Pump rotational speed	50Hz rev/min	1410	1420
	60Hz rev/min	1720	1720 (6 pole)
Normal operating temp. (@ 20°C Ambient)			
without gas ballast	°C	40	36
with gas ballast	°C	-	-
Oil capacity	litres	2.5	3.5
Weight of pump	Kg	72	105
Recommended lubricant		Fomblin - YVAC 06/6	
Inlet connexion		KF40	
Outlet connexion		KF25	
Motor rating 50Hz	kW	1.1 (4 pole)	2.2 (4 pole)
60Hz	kW	1.5 (4 pole)	1.8 (6 pole)

Product description:

Pump - 220/240V or 380/415V ± 6%, 3 phase - 50Hz
Pump - 230V or 460V, 3 phase - 60Hz

SPARES

Superpump Spares Kits	Ordering Number
E2M40S Spares kit	14-A364-13-800
E2M40S Seals kit	14-A364-13-820
E2M80S Spares kit	14-A365-13-800
E2M80S Seals kit	14-A365-13-820
Pump to mist filter connexion kit	04-A500-57-000
MF100AE mist filter element (2 reqd)	14-A223-04-045
Fomblin grade YVAC 06/6 500ml	09-H113-01-016
5kg	09-H113-01-020



(1) E2M40S
(2) E2M80S
(3) E2M40S/EH250F
(4) E2M80S/EH500F

Fig.14 Performance curves for E2M40S/E2M80S Superpumps

LUBRICANTS AND RELATED PRODUCTS -
HEALTH AND SAFETY ASPECTS

Edwards recommended lubricants and related products (see table 1) are not normally hazardous when correctly used and applied. However, certain hazards may arise due to misuse or accident and the following precautions should be observed to avoid danger to health or safety.

ROTARY PUMP OILS - Table 1

Oil Grade	Product Class	*Flash Point °C	Molecular Weight
Edwards No. 8A)		222	420
Edwards No. 15)		234	490
Edwards No. 16)		237	515
Edwards No. 17)	A	236	495
Edwards No. 18)		240	520
Edwards No. 20)		234	490
Shell Tellus Oil 29)		216	450

Note: When oxygen is pumped, a chemically inert and stable pump oil must be used. Use of such an oil can also be advantageous when chemically aggressive gases are liable to enter the pump. Suitable members of the range of synthetic oils known as 'Fomblins' have excellent properties for these applications. Fomblins are fully fluorinated perfluorpolyethers and are non-toxic; they are practically inert chemically and have no flash point or fire point.

* Determined by Pensky-Martans closed cup method.

HEALTH ASPECTS

Skin and Eye contact

Class A - mineral oil based lubricants are only slightly to moderately irritating to skin and eyes. Prolonged exposure of skin to mineral oils may give rise to dermatitis.

The main precautionary measures entail minimising contact with the skin and the observance of good hygiene. Where skin rashes or other abnormalities occur as a result of prolonged contact with mineral oils, medical advice should be sought immediately.

Protective clothing, regularly laundered overalls and personal clothing plus careful skin cleansing, are all important measures to limit contact. Such measures are detailed in HM Factory Inspectorate Cautionary Notices, SHW 295, Effects on the Skin of Mineral Oil and SHW 397, Effects of Mineral Oil on the skin.

Inhalation

Class A - lubricants do not normally give rise to harmful concentrations of vapour except where high temperature and open systems are involved.

Oil mist, however, such as that generated by rotary vacuum pumps should be kept to a minimum, preferably well below the Threshold Limit Value of 5 mg/m^3 for mineral oil. Note: The discharge from rotary pumps will contain a small quantity of oil mist and this can contaminate the environment if the pump is used in enclosed or inadequately ventilated surroundings. It is strongly recommended that a suitable oil mist filter is fitted to the pump or alternatively, the exhaust should be piped away externally. The Edwards OMF and CVP series oil mist filters are recommended for applications in this field.

Fire hazards, storage and spillage

These products require no special fire precautions but it is recommended practice to store away from heat. When heat is required to facilitate handling of the product, this should be kept to a minimum.

If the pump operates in close proximity to possible sources of ignition or where oxygen may form a large proportion of the pumped load, then suitable fire-resistant pump oils (such as Fomblin) should be used.

The pumping of significant amounts of flammable gases and vapours can also present a safety hazard, since explosive mixtures can exist in pump component housings, mist filters and effluent pipes. This hazard can sometimes be controlled by diluting the effluent with nitrogen gas ballast or nitrogen flush, and the fire risk reduced by use of non-flammable pump oil. Control methods, however, depend on particular circumstances.

Fluid spillage should be absorbed with sand, earth or mineral absorbent and disposed of in accordance with the Disposal of Poisonous Wastes Act and Control of Pollution Act 1974.

In the event of large spillages, steps should be taken to prevent pollution of drainage systems, rivers or waterways, or infringement of the above acts.

SOLVENTS

GENKLENE (stabilised trichloroethane) is the preferred cleaning solvent for Edwards products - it has low toxicity and is non-flammable. However, in common with all highly volatile oil and grease solvents, the main hazard is the narcotic, anaesthetic and toxic effects of breathing concentrations of vapour resulting from its use in confined spaces.

Ensure there is adequate ventilation and rate of air change in the cleaning area. Smoking must be prohibited.

COMMUNICATION WITH EDWARDS

Any communication relating to the subject of this instruction should be addressed to Edwards High Vacuum International or to the supplier from whom it was purchased.

Please specify:

1) the model, serial number and code.

2) the date of purchase.

3) your order number and the suppliers sales reference.

Equipment MUST NOT be returned to the supplier without prior arrangement.

IMPORTANT Health and Safety

Under Section 3 of the Health and Safety at Work Etc Act 1974 every employer has a duty to conduct his business so as not to expose persons not in his employment to risks to their health and safety. When goods are returned to the supplier, therefore, warning must be given if their usage is likely to render the equipment hazardous in any way. Your attention is drawn to FORM HSC001 attached.

Edwards High Vacuum International and its distributors reserve the right to refuse acceptance of any equipment returned which they have reason to believe may be hazardous.

Damage in transit

If any damage has occurred in transit, it is important to inform both the carrier and the supplier within three days of delivery.

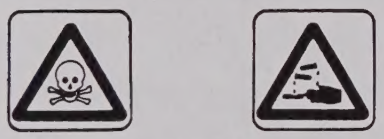
Edwards SERVICE

Edwards High Vacuum
(Part of The BOC Group plc)
W. Sussex RH10 2LW
Tel: 0293 28844
Telex: 87123 edivac g

PROCEDURE FOR RETURNING CONTAMINATED PUMPS TO EDWARDS HIGH VACUUM OR EDWARDS HIGH VACUUM DISTRIBUTOR

When returning a pump to EHV, the following procedure should be followed:

1. All fluid **must** be drained prior to despatching the pumps.
2. All pump outlets must be sealed with suitable blanking covers or PVC tape.
3. All accessories should be removed and if they require servicing, sealed in heavy-duty polythene bags and secured to the pallet with the pump.
4. Inlet and outer mist filters should be removed. All filter elements **must** be removed and disposed of as contaminated waste.
5. Any openings left by removing accessories must be sealed with suitable covers or PVC tape.
6. Pumps and accessories must be sealed in a heavy duty polythene bag and securely strapped to a suitable pallet *(the dimensions of which should not exceed 510mm by 915mm).*
7. The pallet must be labelled in accordance with current Packaging and Labelling Dangerous Substances regulations 1978 (SI No. 209) and subsequent amendments. At the present time (1985) the following labels should be used:



MAY CONTAIN TOXIC OR CORROSIVE CHEMICALS

8. The Service Department at EHV or EHV Distributor must be notified in writing of the nature of the hazard, the name of the carrier and anticipated delivery date, using Form HSC 001. This should be either Faxed *(Fax No. 0293 33453)* or sent by 1st class post to ensure that we have this information before we receive the equipment.
9. A copy of form HSC 001 should be handed to the carrier who must be informed that the cargo may be contaminated and who should present this copy of HSC 001 with the delivery note at EHV.
10. It is recommended that such pumps should only be transported in vehicles where the driver is in a separate cab, *eg open back lorry.*
11. Failure to comply with this procedure will lead to delays in servicing the equipment.

Edwards SERVICE

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W. Sussex RH10 2LW
Tel: 0293 28844
Telex: 87123 edivac g

HEALTH AND SAFETY CLEARANCE FORM HSC 001

1.0 This form must be used when returning pumps and equipment for service at EHV or EHV distributor as per EHV procedure.

2.0 A completed copy of this form should be Faxed *(Fax No. 0293 33453)* or sent by 1st class post to ensure that we have this information before we receive the equipment.

A further copy should be handed to the carrier with the equipment.

3.0 Failure to complete the form or comply with the procedure will lead to delays in servicing the equipment.

4.0 Please complete the following sections:

4.1 Pump/Equipment Type .....

4.2 Serial No. .....

4.3.0 Details of all substances pumped.

4.3.1 Chemical names:

(a) .....

(b) .....

(c) .....

(d) .....

4.3.2 Precautions to be taken in handling of these substances:

(a) .....

(b) .....

(c) .....

(d) .....

4.3.3 Action to be taken in the event of human contact or spillage:

(a) .....

(b) .....

(c) .....

(d) .....

4.4 Any further information which you consider relevant:

4.5 Please complete section 4.5.1 if substances are not toxic or hazardous or 4.5.2 if they are.

4.5.1 I hereby confirm that the equipment specified above has **not** pumped or come into contact with any toxic or hazardous substances and that the equipment has been drained of lubricant.

Signed: .....

Name: .....

Position .....

For and on behalf of: .....

Date .....

4.5.2 I hereby confirm that the only toxic or hazardous substances that the equipment specified above has pumped or been in contact with are named above, that the information given is correct and that the following actions have been taken:

1. The equipment has been drained of lubricant.
2. The inlet/outlet ports have been sealed and the equipment has been securely packed and labelled in accordance with EHV procedure.
3. The carrier has been informed of the hazardous nature of the consignment.

Signed: .....

Name: .....

Position: .....

For and on behalf of: .....

Date: .....

4.6 Carrier to be used: .....

Delivery date to EHV: .....

MP MASTER
MA32914

IMPORTANT

Before returning any product for service this form must be completed and sent to the Edwards company or official distributor undertaking the service.

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